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Detection of Early Carcinoma of the Uterus

SARKIS S. SARKISIAN, *Lieutenant (MC) U. S. N.*[1]

PAPANICOLAOU and Traut (*1*), Meigs et al. (*2*), Ayer (*3*), Graham and Meigs (*4*), Gates and Warren (*5*) and others have already indicated the value of the smear examination for malignant cells. At the U. S. Naval Hospital, San Diego, Calif., the technique for mass evaluation of exfoliative cytology as compared with biopsy in early carcinoma of the cervix was undertaken in June 1948 by the Department of Pathology in cooperation with the Department of Obstetrics and Gynecology.

This is a report of 3,420 cases examined from October 1948 through December 1949; included are 1,500 cases (examined during the period October 1948 through June 1949) previously reported (*6*).

METHODS

When the appearance of a smear is suggestive of cancer, a specimen of tissue from the cervix at four opposed points is obtained for biopsy. If the biopsy is negative or if it reveals carcinoma, a 360° cone is obtained by sharp dissection; cautery is not used in order to procure a satisfactory histologic preparation. The tissue is then subjected to complete serial sectioning and microscopic examination. Thus an accurate representation of the actual pathologic changes is

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obtained and we are then in a position to state with a fair degree of accuracy whether the cancer is preinvasive or invasive. In the invasive carcinomas a smear is examined each week for the first month during and after irradiation; after that a smear is examined each month. If malignant cells continue to desquamate 6 months posttherapeutically, a specimen for biopsy is obtained which, if possible, is a 360° cone of the cervix. This method of follow-up of cervical carcinomas will detect radio-resistant cancer requiring surgical intervention—a modified Wertheim procedure.

FINDINGS AND RESULTS

In the 3,420 patients examined, 42 (1.23 percent) cancers were confirmed by biopsy. Forty-one (1.19 percent) were squamous cell carcinoma of the cervix uteri—30 (0.87 percent) were preinvasive carcinomas of the cervix, and 11 (0.33 percent) were invasive carcinomas. There was 1 (0.03 percent) adenocarcinoma of the endometrium. In an additional 40 patients biopsy has not been completed. The statistics will be revised as information is gathered concerning these cases. Of the 3,420 cases, 17 (0.50 percent) were reported as suspicious of cancer on cervical smear but subsequent biopsy proved that the lesion was benign.

Thus far, of the 22 uteri removed incident to treatment for preinvasive squamous cell carcinoma of the cervix, 15 (68.2 percent) show no histologically demonstrable carcinoma after serial section of the distal 2.5 cm. of the cervix uteri; in 7 (31.8 percent) uteri preinvasive squamous cell carcinoma was noted.

Table 1 lists 42 cases of cancer. In some cases photomicrographs of histologic sections that are representative of the group as a whole are shown to depict the cytologic and histologic criteria on which a diagnosis of cancer is based.

Figure 1 depicts the incidence of carcinoma of the cervix uteri in

TABLE 1

Case number	Smear number	Age (years)	Diagnosis as confirmed by biopsy
1	P18-48	27	Preinvasive carcinoma.
2	P129-48	30	Do.
[1]3	P174-48	36	Do.
4	P196-49	40	Invasive carcinoma.
5	P396-49	44	Do.
[1]6	P479-49	26	Preinvasive carcinoma.
7	P494-49	30	Do.
[1]8	P524-49	30	Do.
9	P579-49	21	Invasive carcinoma.
10	P617-49	44	Do.
11	P648-49	29	Preinvasive carcinoma.
12	P654-49	23	Do.
13	P687-49	24	Do.
[1]14	P746-49	26	Do.
15	P828-49	30	Do.
16	P868-49	39	Invasive carcinoma.
17	P900-49	40	Preinvasive carcinoma.
[1]18	P999-49	25	Do.
19	P1006-49	69	Invasive carcinoma.

TABLE 1—Continued.

Case number	Smear number	Age (years)	Diagnosis as confirmed by biopsy
20	P1114-49	28	Preinvasive carcinoma.
21	P1183-49	34	Invasive carcinoma.
22	P1175-49	27	Preinvasive carcinoma.
23	P1222-49	38	Invasive carcinoma.
24	P1241-49	28	Preinvasive carcinoma.
25	P1260-49	22	Do.
26	P1305-49	47	Do.
27	P1350-49	34	Do.
[1] 28	P1353-49	25	Do.
29	P1447-49	22	Do.
30	P1501-49	30	Do.
31	P1530-49	32	Invasive carcinoma.
32	P1544-49	35	Preinvasive carcinoma.
33	P1745-49	32	Do.
34	P1827-49	56	Invasive carcinoma.
35	P1869-49	29	Preinvasive carcinoma.
36	P1953-49	22	Do.
37	P2153-49	71	Invasive endometrial carcinoma.
38	P2315-49	41	Preinvasive carcinoma.
39	P2326-49	36	Do.
40	P2481-49	34	Do.
41	P2494-49	41	Do.
42	P2535-49	36	Do.

[1] Denotes cases with photomicrographs appended.

the various age groups represented. The age group of patients seen at this hospital lies in the 21- to 30-year bracket; approximately 30 percent of the women are in the menopausal age group. Therefore, there is an overemphasis of values in the younger age group in this study.

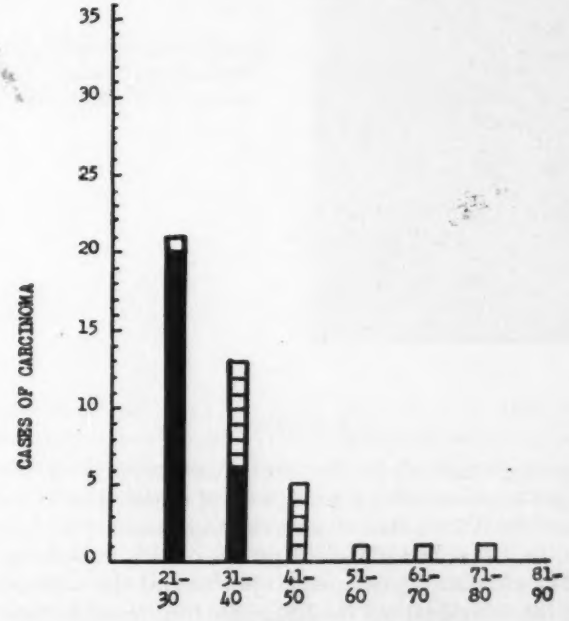
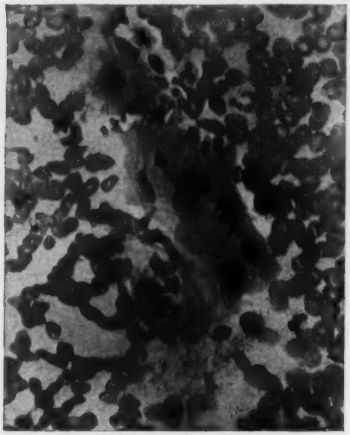


Figure 1.—White area represents the number of cases of invasive carcinoma; the black area represents preinvasive carcinoma.



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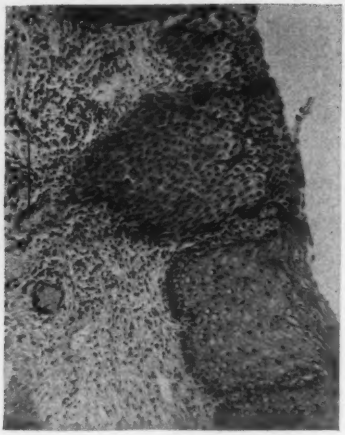

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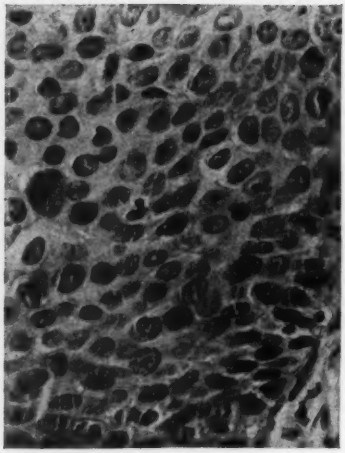
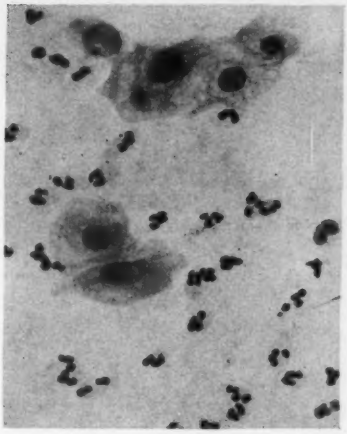


Figure 2.—Case 8, listed in table 1. (A) *Papanicolaou smear.* (B) *Tissue biopsy.* (C) *Tissue biopsy.*

DISCUSSION

The cytologic method for diagnosis of carcinoma is not new. The pathologist has been making a diagnosis of cancer on cell block preparations of fluids from the abdomen, chest, and urinary tract for years; however, he looked for islands or groups of cells in making a diagnosis of carcinoma. Papanicolaou spearheaded the objective of examining the individual cell for diagnostic features of malignancy.



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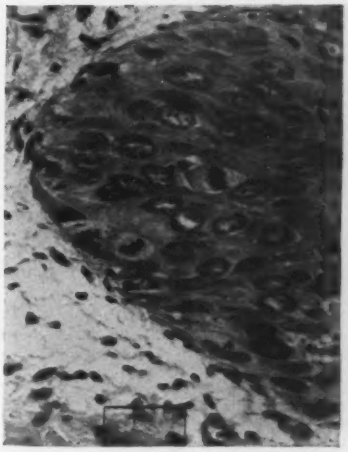

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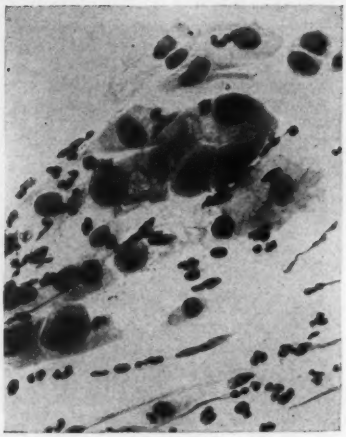
Figure 3.—Case 18, listed in table 1. (A) *Papanicolaou smear.* (B) *Tissue biopsy.* (C) *Tissue biopsy.*

In 1929, MacCarty (*7*), and later Guttman and Halpern (*8*), called attention to the changes in the nucleolus of the cell as an aid in the diagnosis of malignancy; however, the latter pointed out the inaccuracy of depending on this change alone. Hauptmann (*9*) has described the cytologic features of malignant cells and classified them into five basic types. Peters (*10*), Fremont-Smith et al. (*11*), Wiles and Hellwig (*12*), Scheffey et al. (*13*), Lombard et al. (*14*), and others have pointed out the value of the cytologic smear examina-



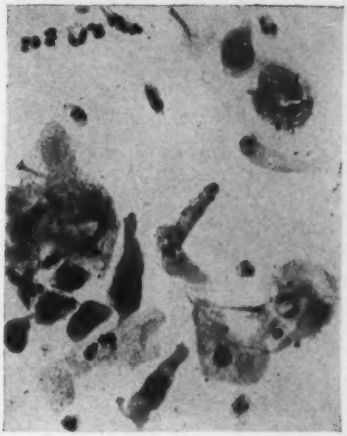
A

B

C

Figure 4.—Case 3, listed in table 1. (A) *Papanicolaou smear.* (B) *Tissue biopsy.* (C) *Tissue biopsy.*

tion for the detection of cancer. The salient features of a malignant cell are based upon a comparison of the cell with a normal-type cell of the tissues desquamating these cells. There are certain basic features present—these are demonstrated by the photomicrographs of malignant cells shown in figures 2*A*, 3*A*, 4*A*, 5*A*, 6*A*, and 7*A*. In the malignant cell there are hyperchromatic nuclei with coarse chromatin clumps and irregular nuclear borders; the nuclear-cytoplasmic ratio is generally greatly decreased, i. e., the larger the nucleus, the greater is the likelihood of malignancy. Occasionally, multinucleated cells are seen (figures 4*A*, 5*A*, 6*A*, and 7*A*). Thus, the morphology of the



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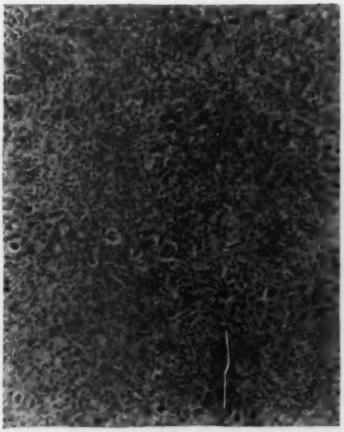

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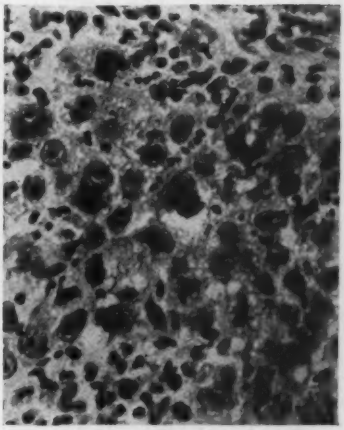
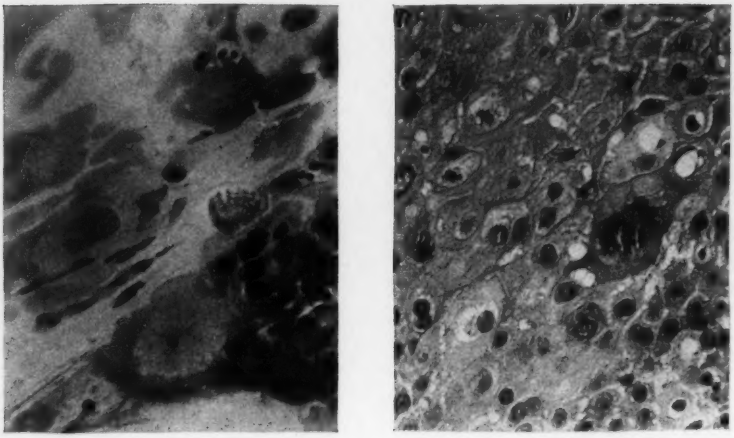


C

Figure 5.—Case 28, listed in table 1. (A) *Papanicolaou smear.* (B) *Tissue biopsy.* (C) *Tissue biopsy.*

individual cell is as important in determining the presence of cancer as is the architectural pattern of a tissue, and it is almost as reliable. Figure 2*B* demonstrates the architectural pattern of preinvasive carcinoma in immediate proximity to benign squamous epithelium. Figure 5*B* is a totally bizarre architectural pattern of invasive carcinoma.

By examining the photomicrographs of the Papanicolaou smear and comparing the malignant cells with the respective tissue biopsy, one can identify the source of the cells. The source of the malignant cells in the smear can be observed in figures 6*A*, 6*B*, 7*A*, and 7*B*. Once

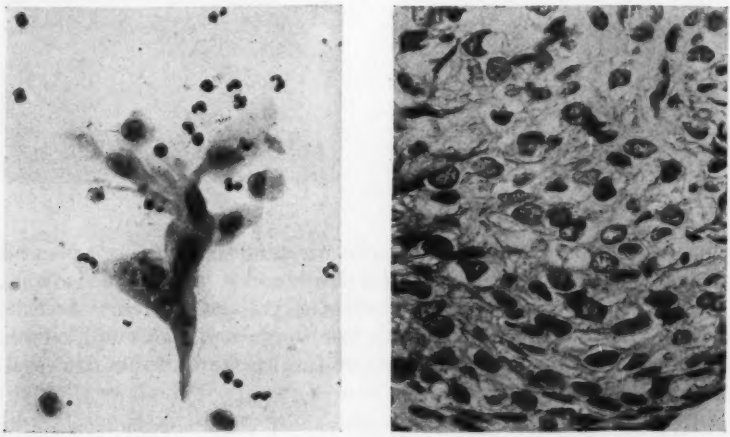


A B

Figure 6.—Case 14, listed in table 1. (A) *Papanicolaou smear.* (B) *Tissue biopsy.*

the pathologist is acquainted with the cytologic variations of the normal desquamated cell, the presence of malignant changes can readily be detected.

In the examination of 22 uteri which were surgically removed incident to treatment for preinvasive squamous cell carcinoma of the cervix, 68.2 percent revealed no cancer. Does this mean that carci-



A B

Figure 1.—Case 6, listed in table 1. (A) *Papanicolau smear.* (B) *Tissue biopsy.*

noma of this type can be removed by a 360° conization of the cervix? It would appear, in the light of our present knowledge, that this does not constitute adequate treatment of carcinoma in situ.

Younge et al. (*15*) states: "If the carcinoma in situ involves only the surface epithelium and does not involve the cervical glands, thorough destruction of the surface lesion by cauterization or complete excision by sharp conization will apparently cure 85 percent of such cases." This is a very brave stand; but, until more is known about this disease, hysterectomy is the treatment of choice regardless of the age of the patient.

The foregoing indicates the highly specialized and controversial field we are dealing with and by virtue of this, it is believed that the cytologic smear methods for diagnosis of malignancy should be left to the highly trained pathologists in well-equipped laboratories where proper evaluation can be made. Jeopardy to the patient or embarrassment to the physician can then be obviated. Novak (*16*) states "* * * the chief workshop for this purpose should for the present be well-organized and well-equipped clinics."

SUMMARY

Of 3,420 patients screened cytologically 42 or 1.23 percent showed cancer. In 17 (0.50 percent) a false positive was reported. Of 22 uteri examined after surgical removal incident to treatment for preinvasive squamous cell carcinoma, 15 (68.2 percent) showed no histologic evidence of cancer.

A diagnosis of preinvasive squamous cell carcinoma of the cervix should not be made until a 360° cone of the cervix is subjected to serial examination.

The Papanicolaou-Traut stain of a cervical smear is of definite value in the detection of early carcinoma of the uterine cervix.

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Treatment of Tinea Capitis With Local Medication

WILLIAM C. MARSH, *Commander (MC) U. S. N.*[1]

TREATMENT of ringworm of the scalp (especially when it is caused by *Microsporum audouini*) has always been a problem to physicians treating dependents in out-patient clinics. It was thought for many years that roentgen epilation was necessary for cure. Even when technicians adequately trained in the Kienböck-Adamson technique of roentgen epilation were available, the pediatric or dermatologic follow-up care was not always available. The transient status of patients added to the difficulties. In recent years the work of Schwartz et al. (*1*), MacKee et al. (*2*), and Scully et al. (*3*) in local therapy has given hope that this condition may be treated with local medication on a true out-patient basis.

Thirty-two patients (22 boys and 10 girls) with *M. audouini* infections were treated between December 1948 and August 1949. Of these, 31 were treated with a preparation containing 25 percent zinc undecylenate, 2 percent undecylenic acid, and 5 percent salicylanilide in a carbowax base. Of the 32 patients, 20 had previously received local therapy including 10 percent copper undecylenate ointment; sopronol liquid and ointment; tincture of iodine; 10 percent ammoniated mercury ointment; and 5 percent salicylanilid ointment. None of these medications had been effective although some had been used as long as 3 months.

Age incidence.—Fourteen were between 2 and 6 years of age; 15 between 7 and 9 years of age; and 3 from 10 to 11 years of age.

Epidemiology.—Twelve patients had siblings who also had ringworm of the scalp.

Cultural studies.—All patients were first examined in the clinic with the use of a filtered ultraviolet light. Fluorescent hairs were removed with a fine forceps, coated with eosin in collodion, and planted on Sabouraud's medium. *M. audouini* was obtained in 31 cases and *M. lanosum* in 1 case.

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Inflammatory response.—Using the criteria determined by Scully et al. (*3*), each patient was graded 1-plus to 4-plus. The criteria for grading were used either at the start of treatment or during the course of treatment. Six patients showed a 1-plus reaction; five patients a 2-plus reaction; five patients a 3-plus reaction; and four patients a 4-plus reaction or typical kerion formation (a boggy mass, with deep-seated suppuration and multiple draining sinuses).

In the severe inflammatory cases, alopecia developed, which was feared to be permanent at the time. However, a check of three of the four severe kerion reactions with alopecia revealed that all have had complete regrowth of hair. The fourth case was not observed.

TREATMENT

Instructions given to the parents on the initial visit to the clinic are of prime importance. The infected areas are pointed out to the parents, and in some cases outlined with gentian violet; parents were given the following instructions: (*a*) Shave all infected areas, including at least 1 inch of surrounding normal hair. If three or more areas larger than 25-cent pieces were noted, the entire scalp was shaved. (An occasional exception to this rule was allowed in girls.) (*b*) The applicator was to be made by placing three or four layers of soft cloth over the round head of an old-fashioned type wooden clothespin and securing the cloth with a rubber band. (*c*) All infected areas were to be rubbed with the ointment 10 minutes, by the clock, twice a day.

The patients were examined under the filtered ultraviolet light at weekly intervals. Manual epilation was not practiced unless all the infected hairs could be removed (if less than 10 fluorescent hairs were present).

A favorable sign is the occurrence of an inflammatory reaction after the institution of treatment. Applications of the ointment were continued unless severe kerion developed; then hot compresses of magnesium sulfate were applied to control the infection. Other factors which indicate a favorable outcome are loosening of the hair and rapid loss of the fluorescent property of the hair (which changes from the original green to a gray color under the ultraviolet light).

Criteria of cure in our series was the absence of any fluorescent hairs for at least 2 months after cessation of treatment and a negative culture on Sabouraud's medium after negative examination under the ultraviolet light 1 month previously.

The results of treatment of *M. audouini* infections in the series are outlined in table 1.

TABLE 1.—*Results*

Weeks of treatment	Number of cases cured	Percent of total	Weeks of treatment	Number of cases cured	Percent of total
6	1	3.2	15 to 17	2	6.5
7	1	3.2	18 to 20	1	3.2
8 to 11	15	48.4			
12 to 14	11	35.5	Total	31	100.0

Scully et al. (*3*) suggested that, with careful clinical care and follow-up and with the cooperation of parents, most cases of tinea capitis due to *M. audouini* could be cured by local medication. It is believed that the excellent results in this series were due to the medication used and the excellent cooperation of the parents. Over 90 percent of the patients were discharged from treatment as cured in 4 months or less. This period of time compares more than favorably with that required by roentgen epilation and follow-up care.

It is our opinion at this time that the military service could easily adopt this routine for out-patient care of tinea capitis. Furthermore, local medication should be used for a minimum of 3 months before roentgen epilation is considered.

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The Clinical Use of Antibiotics

III. Treatment of Dental Infections [1]

PERRIN H. LONG, *Colonel, MC, A. U. S.*[2]

THE advent of the sulfonamides and of the antibiotics has placed powerful therapeutic tools in the hands of the dental officer and has revolutionized the treatment of dental infections. The dental officer should keep abreast of the latest advances in the field of the anti-infective agents, and especially in that of the antibiotics, because, at present, there are few indications for the primary use of the sulfonamides in dental infections. An understanding of proper dosage schedules and the clinical pharmacology and toxicology of the antibiotics is necessary if maximal benefits are to be reaped from the use of these agents in the prevention or treatment of dental infections.

Actinomycosis

Because actinomycosis may arise in or about the structures of the jaw, the dental officer must always be on the lookout for it in patients in whom there is a delay in the resolution of, or a recurrence of, an inflammatory process, especially if the infection is accompanied by multiple draining sinuses. The treatment of actinomycosis of the jaw represents an instance which requires the cooperative efforts of the dental and medical officers. A combination of a preparation of penicillin G with sulfadiazine should be used in treating this disease.

Alveolar Postoperative Infection

Alveolar postoperative infection in general is caused by a mixture of micro-organisms such as alpha hemolytic streptococci, staphylococci, *Borrelia vincentii*, and *Fusiformis dentium*. It occurs most frequently after extraction of third molars in the mandible. A preparation of penicillin G, especially an ointment of penicillin in an anhydrous, nonhydroscopic base, is recommended. Rarely more than two or three treatments at 24- or 48-hour intervals are needed to bring

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[1] The third of four articles on this subject. Parts I and II appeared in the August and September issues of this JOURNAL.

[2] Department of Preventive Medicine, Johns Hopkins University School of Medicine, Baltimore, Md.

about the desired effect. If the indications are that an extraction will be difficult, it is a good plan to administer, as a prophylactic measure, 300,000 units of procaine penicillin G in oil with 2-percent aluminum monostearate added, about 4 to 6 hours before the operative procedure.

Cellulitis

Dental infection is a common source for the development of extensive and rapid cellulitis of the floor of the mouth. Such a cellulitis represents a problem that frequently requires the combined attention of both the dental and medical officer. It requires prompt and intensive treatment if serious consequences are to be avoided. For instructions, see Streptococcal Infections.[3]

Cheilosis

Angular cheilosis, especially if associated with lesions of the tongue, may be an early manifestation of riboflavin deficiency. The angular lesions may become secondarily infected with hemolytic streptococci or staphylococci. Give adequate doses of riboflavin provided in a good B-complex multivitamin preparation. If the infection is mild, nothing need be done except to observe the rules of cleanliness. If severe, the administration of two doses of 300,000 units of procaine penicillin G in oil with 2-percent aluminum monostearate added, at intervals of 72 hours, will, as a rule, control the infection.

Gangrenous Stomatitis

This disease occurs in debilitated persons. Infection does not play a primary role but may be an important secondary factor. The bacteria involved are the normal inhabitants of the mouth. In treating patients with this disease use those measures that will normally control the cause of the debilitation. Initially, crystalline penicillin G is given intramuscularly in doses of 25,000 units every 3 hours. Aureomycin, given as recommended for moderately ill patients, may be used.

Herpetic Stomatitis

Herpetic stomatitis is caused by the virus of herpes simplex and may occur as an isolated instance or may be epidemic. It is frequently misdiagnosed because the white, glistening vesicular caps are mistaken for flakes of exudate. Aureomycin should be tried as recommended for moderately ill patients. The auxiliary therapy is that of acute tonsillitis or pharyngitis. The soreness of the throat is generally out of proportion to the visible lesions.

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[3] Part II of this series, p. 1001, U. S. Armed Forces Medical Journal, Sept. 1950; and Part IV (to be published next month).

Maxillary Sinus Infection

If the dental officer has the misfortune to fracture the floor of the maxillary sinus during the extraction of an upper molar, he should promptly seek the advice of a competent otolaryngologist regarding specific treatment.

Oral Moniliasis

This disease is not known to respond to sulfonamides or antibiotics.

Osteomyelitis

Osteomyelitis of the mandible often follows a compound fracture of the jaw or the extraction of lower molar teeth when there has been much destruction of alveolar bone. When the infection is sharply localized, a typical "dry socket" is produced. If, however, the infection spreads to the inferior dental vessels, an extensive osteomyelitis may result. The bacterial flora in osteomyelitis of the mandible is generally mixed.

Treatment.—Either penicillin G or aureomycin may be used. If crystalline penicillin G is employed, the dose should be 25,000 units administered intramuscularly every 3 hours until the infection is controlled. The penicillin preparation of choice for most instances in which this drug is indicated is procaine penicillin G (300,000 units) with 100,000 units of crystalline penicillin G added. It should be given in watery suspension intramuscularly every 8 to 12 hours. As a third choice among the penicillins, 300,000 to 600,000 units of procaine penicillin G in vegetable oil with 2-percent aluminum monostearate added could be given intramuscularly at intervals of about 48 hours. When aureomycin is used it should be given in the doses recommended for moderately ill patients. As sequestra and necrotic material are almost invariably present in this condition, and because of the nature of the infection, there is little chance that sterilization of the lesion can be accomplished by the administration of antibiotics alone. *It is of the highest importance that proper surgical attention be given to the patient by a competent oral surgeon.* This is not an infection with which to experiment. The oral surgeon should be consulted at the beginning of the process. If the extraction has been difficult and there is a possibility that a "dry socket" will result, a preparation of procaine penicillin G with crystalline penicillin G added, administered intramuscularly in aqueous suspension every 12 hours for at least 72 hours, should be used to combat the impending infection.

Periapical Infection

The treatment of periapical infection and the problems involved in it are those of the treatment of an abscess or an infected cyst. The

infection may be caused by any one of, or a mixture of, the micro-organisms which inhabit the mouth.

Treatment.—In the conservative treatment of periapical infection, a rapid- and slow-acting preparation of penicillin containing 100,000 units of crystalline penicillin G and 300,000 units of procaine penicillin G, administered intramuscularly in aqueous suspension at intervals of 8 to 12 hours, is of value in bringing the infection to the point at which surgical intervention is indicated. This treatment should be continued for at least 48 hours after incision and drainage have been accomplished. Other methods of antibiotic therapy have been tried. The area of the infection has been infiltrated with an aqueous solution of crystalline penicillin G containing 2,500 units per cc., together with the injection of small amount of the solution of penicillin directly into the pulp canal of the diseased tooth. The flooding of the diseased root canal with solutions containing 50,000 units of crystalline penicillin G has been advocated. Dental paper points containing 3,000 units of penicillin have been used for shortening the time supposedly needed for sterilizing the root canals in the treatment of periapical infection. In addition, incision and drainage help to eliminate or localize the infection. Cold applications to the face and hot irrigations intra-orally comfort the patient and assist in bringing about a resolution of the infectious process.

It is probable that aureomycin given orally will prove to be of value in the control of periapical infection.

Pericoronitis

Acute pericoronitis is generally produced by one or a mixture of the normal bacterial inhabitants of the mouth. A penicillin ointment containing at least 1,000 units per cc. should be forced gently, through a blunted needle, between the erupting tooth and the soft tissue. This may be repeated as often as is considered necessary. Cold compresses applied to the face may reduce the pain incident to this infection.

Periodontitis (Pyorrhea)

The cause of pyorrhea is not definitely known, but vitamin deficiencies are believed to be a contributing factor. The secondary infection is produced by a mixture of the micro-organisms which inhabit the mouth. There is no specific therapy. Improvement may be noted if the teeth are thoroughly scaled and then penicillin packs with dry tinfoil are applied. If a vitamin deficiency exists, therapeutic doses of vitamin C and of the B complex should be given. Antibiotics *do not cure* pyorrhea. They may help to decrease the severity of secondary infection.

Vincent's Infection

While this disease may occur in endemic and epidemic forms, it is probable that it is not communicable in the ordinary sense of the word, and that, at least insofar as the endemic form of Vincent's infection is concerned, other basic causes are responsible. The exciting organisms are *Borrelia vincentii* and *Fusiformis dentium*. Other bacteria in the mouth may play some role in the production of the disease. The predisposing causes may be divided into those that are local and possibly those that are systemic in type. Among the supposed local causes are calculi, orthodontic appliances, metallic deposits, areas of occlusal overfunction, erupting of malposed teeth with gum flaps, overhanging gingival margins of fillings, ill fitting crowns, faulty restoration, and other results of poor dentistry. The systemic contributing causes include agranulocytosis, leukemia, aplastic anemia, certain vitamin deficiencies, and chronic malnutrition. Whenever possible, the local or systemic factors must be controlled if satisfactory results from antibiotic therapy are to be obtained and maintained. The local factors should always be corrected if possible by the dentist, and the dental officer in conjunction with the medical officer should attempt to correct adverse systemic factors which may play a role in producing this disease.

Penicillin is the drug of choice. Procaine penicillin G in doses of 300,000 units with 100,000 units of crystalline penicillin G added, in watery suspension, is given intramuscularly every 8 to 12 hours until the infection is controlled. Local factors which predispose the patient to this infection must be corrected.

THE PROPHYLAXIS OF SYSTEMIC INFECTION IN DENTAL PRACTICE

The mouth is teeming with many different species of bacteria. Teeth that need to be extracted are generally infected with one or more varieties of the bacteria of the mouth. At extraction, host-parasite relations are disturbed and, in many instances, bacteria pour into the blood stream. As a rule, this bacteremia is transient and does no harm, but in patients who have rheumatic or other types of heart disease, these circulating bacteria may settle on the heart valve and produce subacute bacterial endocarditis. Patients who have acute, subacute, or chronic nephritis may have a flare-up of their disease following the extraction of teeth, and patients with diabetes often react poorly after the same procedure. *The dental officer should inquire of every patient for whom an extraction is advised as to whether that patient has had rheumatic fever or rheumatic heart disease, degenerative heart disease, nephritis, or diabetes.* If the inquiry elicits a positive reply, the patient should be treated prophylactically with penicillin or aureomycin before and after the tooth is extracted.

SUMMARY

The treatment of dental infections has been revolutionized by the introduction of antibiotics. The dental officer should take full advantage of the benefits offered by these agents. In many instances, efficient treatment of infections of tooth and jaw structures is best achieved by a cooperative effort between the dental and medical officers.

The Care of Premature Infants

JOHN C. W. CAMPBELL, *Lieutenant, junior grade (MC) U. S. N.*

IN the period from 30 April 1947 to 1 May 1948 there were 828 live births recorded at the U. S. Naval Hospital, Philadelphia, Pa. Of these births, 56 or 6.75 percent were classified as premature—prematurity being determined according to the resolution adopted in 1935 by the American Academy of Pediatrics (*1*):

> A premature infant is one who weighs 2,500 gm. (5.5 lb.) or less at birth (not on admission) regardless of the period of gestation. All liveborn premature infants should be included, evidence of life being heart beating or breathing.

Fourteen premature infants did not survive beyond the tenth day: a mortality rate of 25 percent. The weight of these premature infants ranged from 364 gm. (13 oz.) to 2,380 gm. (5 lb., 5 oz.).

As shown in table 1, the greatest number of deaths were among those infants who weighed less than 1,500 gm. (3 lb., 5½ oz.). The lone survivor of this group weighed 952 gm. (2 lb., 2 oz.).

TABLE 1

Weight (grams)	Number of cases	Deaths	Mortality
			Percent
Under 999	8	7	87.5
1,000 to 1,499	2	2	100.0
1,500 to 1,999	8	2	25.0
2,000 to 2,399	33	3	9.1
2,400 to 2,500	5	0	.0
Total	56	14	25.0

There were 14 deaths in this series (table 2). Autopsies were performed in all except one. Immaturity, the most frequent cause of death, accounted for 6 fatalities. Intracranial hemorrhage accounted for 3 deaths; erythroblastosis fetalis caused 1 death; congenital heart disease, 1 death; intra-abdominal hemorrhage, 1 death; and pneumonia caused 1 death.

CARE OF THE PREMATURE INFANT

The care of the premature infant begins at the time of the delivery. We believe that with the close cooperation of the pediatrician and

TABLE 2

Case No.	Birth weight		Sex	Gestation age	Hours of life	Mother's Rh factor	Mother's blood Kahn test	Cause of death (autopsy)	Cause of prematurity	Feedings
	Pounds and ounces	Grams								
1	13 oz	364	F	23 wks	24″	Positive	Negative	Prematurity	Twin	None.
2	15 oz	436	F	22 wks	10′ 40″	(1)	do	do	Criminal abortion	None.
3	1 lb. 4 oz	560	F	5½ mo	20″	Positive	do	do	Placenta previa	None.
4	1 lb. 5 oz	588	F	23 wks	32″	do	do	Cerebral hemorrhage	Twin	None.
5	1 lb. 8½ oz	686	F	6 mo	11′ 25″	do	do	Peritoneal hemorrhage	Twin (unknown)	None.
6	1 lb. 12 oz	784	F	6 mo	13′ 5″	do	do	Prematurity	do	None.
7	2 lb. 3 oz	980	F	6 mo	34′	Negative	do	do	Abortion	Formula.[2]
8	2 lb. 5½ oz	1,050	M	6 mo	128′	(1)	(1)	No autopsy, pulmonary congestion.	Unknown. No prenatal care	Do.
9	3 lb	1,344	M	6½ mo	123′	(1)	Negative	Cerebral hemorrhage	do	Do.
10	3 lb. 10½ oz	1,638	M	7 mo	10′ 55″	Positive	do	Prematurity	Unknown	None.
11	4 lb	1,792	M	9 mo	34′ 50″	(1)	(1)	Cerebral hemorrhage	Twin	Formula.[2]
12	4 lb. 10 oz	2,072	M	9 mo	57′ 20″	Positive	Negative	Congenital heart disease	Preeclampsia, chronic nephrosis	Evaporated milk.
13	4 lb. 12 oz	2,128	F	7 mo	209′	do	do	Prematurity, pneumonia	Premature rupture of membrane	Formula.[2]
14	5 lb. 5 oz	2,380	M	8 mo	63′	Negative	do	Erythroblastosis fetalis	Mother had 12 previous transfusions.	Do.

[1] Unknown.
[2] Mixture of skimmed milk solids, dextrins, maltose, corn oil, calcium caseinate, and halibut liver oil.

obstetrician the number of neonatal premature deaths can be kept at a minimum. It is the practice of this service to have the pediatrician notified of any pending premature birth, in order that he might be present at the delivery.

In those cases in which there is great difficulty resuscitating the infant, especially with the smaller premature infants, the pediatrician takes over the task of resuscitation if so desired by the obstetrician. Any mucus, amnionic fluid, or meconium is removed from the air passages by aspiration to provide an unobstructed airway. Since inspiration frequently occurs as the head is delivered the obstetrician should aspirate as much mucus as possible at this stage.

Following delivery, the infant is placed in a warmed blanket and if the respirations of the child are normal, the child is moved to a heated crib in the nursery. If further resuscitation is necessary, and there is an adequate air passage, oxygen by face mask is given. In cases requiring prolonged resuscitating efforts, the infant is placed in a tub of warm water with temperature between 95° and 100° F. (*2*) to maintain body heat, and to provide a means of establishing a contrast in temperatures, which frequently acts as a respiratory stimulant. This is accomplished by removing the child from the warm water to the air at room temperature, not by plunging the infant in a tub of cold water. In this way the body temperature is not lowered appreciatively, but the purpose is accomplished.

Upon their arrival in the nursery, all premature infants weighing 5 pounds or less are placed in a previously heated incubator with an oxygen content between 45 and 50 percent and a relative humidity between 70 and 77 percent (*3*) (*4*). Menadoine, 2.0 mg., is given intramuscularly on admission to the nursery to elevate prothrombin levels and to prevent cerebral and umbilical hemorrhages (*5*) (*6*) (*7*). The air passages are cleared if necessary. The authors do not believe that any of the respiratory stimulants are of great value in resuscitation of the newborn.

The incubator is kept at a temperature sufficient for the premature child to maintain as near normal a body temperature as possible. Hot-water bottles are used in conjunction with the incubator heat, if necessary. It is desirable to maintain the percentage of oxygen between 45 and 50 percent and the relative humidity between 70 and 77 percent (*4*). The higher percentages are used with the smaller infants. As the child's weight increases, the concentrations of oxygen and percentages of humidity are dropped. High concentrations of oxygen are best with high percentages of humidity (*3*) (*8*).

As soon as respiration is established, the premature child is left alone for from 12 to 24 hours (depending on weight) with minimal

handling. No clothing is used except for a loosely pinned diaper: clothing means frequent handling. The larger infants are given 5 percent dextrose in distilled water by mouth at 12 hours (*4*); the smaller infants proportionally later. The method of feeding, again depending on weight, is by nipple or by gavage, using hypodermoclysis, as a means of maintaining body fluid levels. The larger and stronger premature infants are breast-fed, with supplementary feedings if necessary. The amount of formula by mouth varies from 4 cc. every 1 to 2 hours to 30 cc. every 3 hours. An artificial formula is given 6 to 12 hours after the initial feeding of dextrose solution. At this institution, we use a prepared mixture of skimmed-milk solids, dextrins, maltose, corn oil, calcium caseinate, and halibut liver oil for feeding the premature infant.

When administering fluids by hypodermoclysis, 20 cc. per kg. (3 dm. per lb.) is given, using the back as the site of injection (*9*). It is desirable to give 165 cc. to 200 cc. per kg. (2½ to 3 oz. per lb.) of body weight as the total amount of fluids for a 24-hour period.

As soon as the infant is taking the 5 percent dextrose solution without difficulty, we start a dilute formula, giving approximately 45 to 65 calories per kg. (20 to 30 per lb.) of body weight. When the infant is able to tolerate it, an increased and more concentrated formula is given. We believe that a high caloric intake is of importance for the rapid growth and development of the premature child. Therefore, we frequently give formulas which contain as many as 240 to 264 calories per kg. (105 to 120 calories per lb.). By the second day of life we supplement the diet with vitamins, especially vitamin C, giving 50 to 100 mg. daily (*4*) (*10*). As the premature infant grows older (age 21 days) we begin iron therapy in the form of elixir of ferrous sulfate (*2*).

A few days before discharge, the child is given an evaporated milk formula, using one part of evaporated milk to two parts of boiled water. The carbohydrates are supplemented by the addition of approximately 1 ounce of dextro-maltose. A water-soluble multivitamin preparation is added to one of the feedings. The child is fed every 3 to 4 hours as determined by weight and feeding demands. The discharge date depends on the progress of the infant and the home surroundings. The average premature infant is not discharged until it has reached a weight of 2,464 gm. (5 lb. 8 oz.). For those infants born of Rh negative mothers, a daily red blood cell count, hemoglobin, and a blood smear for immature red cells is done for the first 5 days of life, and then at weekly intervals until the child is 6 to 8 weeks old.

COMMENT

Care of the premature infant demands special consideration and differs from the care required by full-term infants. Their environment and handling, as well as the special formulas necessitates close supervision and foresight on the part of the physician.

In a naval hospital, the rotation of nursery-room personnel requires that the handling of premature infants be standardized as closely as possible. With this in mind we have chosen a prepared mixture of skimmed-milk solids, dextrins, maltose, corn oil, calcium caseinate, and halibut liver oil as the simplest formula that possesses the nutritional value which the premature baby requires.

It has been shown in the studies of fat absorption by Tidwell et al. (*11*) (*12*) that olive oil and soy-bean oil are far more completely absorbed than butterfat. Further it has been observed that when these fats are substituted for butterfat, the weight gain is usually more rapid (*11*) (*12*).

In Adams' (*13*) series of 56 premature infants, who were given a simple evaporated milk formula, the average time required to regain birth weight was 12.5 days. In our series the average time required was 8½ days. This compares favorably with the grid as worked out by Dancis, O'Connell, and Holt (*14*) for recording weight of premature infants.

We believed that the ease in preparation of this type of formula is of advantage in that no great skill or complicated preparation is needed and yet standardized formulas are obtained.

The use of unmodified human milk for feeding, as shown by Gorden, Levine, and McNamara (*4*) does not give as rapid a weight increase as other types. Further, the necessity for collecting and pasteurizing human milk makes it less desirable than the use of readily available artificial formulas.

CONCLUSIONS

1. The care of the premature infant begins at time of delivery.

2. Premature infants require an environment of high-oxygen content with suitable humidity and heat.

3. A high caloric intake is required for the growth and development of these infants.

4. Early addition of vitamins, especially vitamin C, to the diet of premature infants is of value.

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Efficient Full Denture Service

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THE technique herein described should enable the operator to establish a more accurate functional bite registration in the construction of full dentures. Assuming that accurate impressions are obtained and correct vertical dimensions recorded, this technique will reduce occlusal adjustments to a minimum thus saving time and providing the patient with an accurate balanced occlusion free from lateral interference. Inasmuch as the Hanau articulator is now a standard item of supply, it is suggested that it be used whenever possible.

THE GOTHIC ARCH TRACING AND ITS APPLICATION TO DENTURE CONSTRUCTION

The anterior segment of the mandible will scribe a gothic arch as the head of each condyle separately rotates in the glenoid fossa while the opposing condyle travels downward and forward if this movement is started from a true centric relation of the mandible to the maxilla at a given vertical opening. A gothic arch with straight lateral markings results if this movement is begun at a given vertical opening and the condyles are in the most comfortable retruded position in the glenoid fossa from which lateral movements can be made. When such a gothic arch tracing is produced it indicates that the mandible is in proper centric relation to the maxilla. Correct centric occlusion occurs when the patient closes the jaws during swallowing and at the end of each masticatory stroke. If accurate centric occlusion is not registered on the articulator the mandibular and maxillary teeth will not interdigitate in correct centric relation resulting in occlusal interference and trauma to the supporting tissues. If occlusal interference of the teeth is present a sequence of events will be established which will produce the following disturbing results: (*a*) Impact shock will produce trauma; (*b*) trauma will produce inflammation; (*c*) inflammation will produce ridge resorption; (*d*) ridge resorption will produce additional unbalanced occlusion; and (*e*) this additional unbalanced occlusion will lead to more trauma. This trauma may result in an inflammatory reaction in the soft tissue followed by osteoclastic resorption of the alveolar bone. Tenderness beneath the denture may occur, necessitating frequent adjustments and early and frequent rebasing, all contributing to the dissatisfaction of the patient.

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Balanced occlusion may be established during the anteroposterior excursions of the mandible by use of a protrusive check bite record established on the gothic arch tracing. This record will measure the approximate distance the mandible drops, in the posterior region, when the patient protrudes the mandible from 4 to 6 mm. Such a range of movement exceeds the distance the mandible travels during the actual trituration of food but the relations obtained will establish occlusal balance during and at the end of each protrusive to centric masticatory stroke. Protrusive records, when transferred to a semiadaptable articulator, permit setting the condylar elements of the articulator at an inclination which approximates the inclination of the eminentia articularis. Dentures constructed from an accurate centric record with teeth articulated in conformity with the anatomic condylar inclinations should be in balance when the mandible is in the incisive or centric position. Thus trauma is reduced, the patient's comfort enhanced, and masticating efficiency improved.

Additional data are obtainable from the gothic arch tracing if the maximum in balanced occlusion, during all the excursive movements of the mandible, is recorded. Right and left lateral plaster check bites will contribute to balanced occlusion during all of the eccentric to centric movements of the mandible. Records obtained by these lateral check bites may be transferred to the articulator and incorporated into the denture. Thus, it is possible to eliminate all cuspal interference during the excursive movements of the mandible. Failure to duplicate Bennett movement and centers of rotation results in cuspal interference during both eccentric to centric occlusion. This is expressed in a lateral force that is transmitted to the alveolar ridge.

If the triangle A B G (fig. 1) represents the mandible in centric position with G being the centric position of the tracing stylus, the following observations can be made. Consider D, B, and F as three separate centers of rotation, one of which will be correct for the patient. If the distance between the condylar elements of the articulator were the same as the distance between A and B, or the patient's intercondylar width, then the center of rotation of the patient's left condyle would be at B and the arc BB′ would be scribed when the patient moved the mandible into right lateral positional relationship. This case could then be transferred to the articulator and the same arch produced. The patient's intercondylar width and the distance between the condylar elements of the articulator are, however, rarely the same. The anatomic rotation centers may be at D or F and consequently arches DD′ or FF′ would then be scribed. If the center of rotation of the articulator is at B and the patient's centers of rotation at D or F, the cuspal paths on the articulator would not travel in the same arc when placed in the patient's mouth. Thus cuspal interfer-

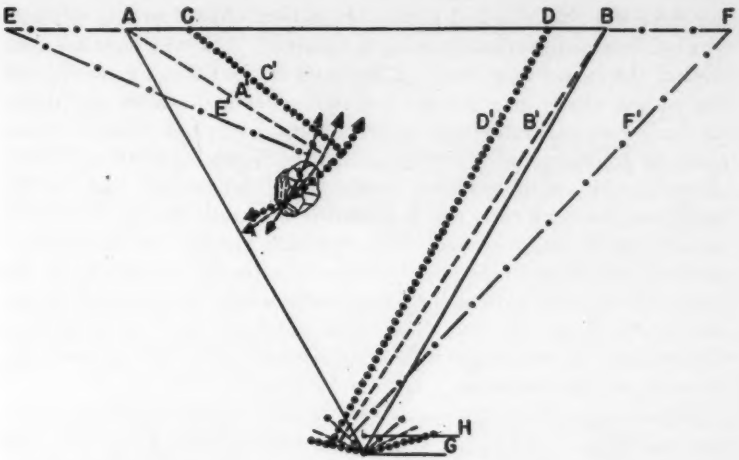


Figure 1.

ence would immediately occur when the mandible moved into lateral excursions. This is graphically represented by using E, A, and C as separate centers of rotation and EE′, AA′, and CC′ as the paths produced by the mesiobuccal cusp of the lower right first molar. Note the different paths traveled by this cusp when E, A, and C, respectively, are used as centers of rotation. Certainly cuspal interference must occur when the center of rotation of the articulator and that of the patient do not coincide. There are additional factors such as Bennett movement that contribute to this error but they need not be considered here. The amount of cuspal interference that results when a case is constructed on a fixed articulator whose intercondylar width is different from that of the patient and with a centric relationship established at H instead of at G is obvious.

Lateral plaster check bites, when transferred to an adaptable articulator, will establish centers of rotation and Bennett movement on the instrument that are equivalent to those in the mouth. Dentures constructed on adapable instruments from the check-bite records taken from gothic arch tracings will be more comfortable, more efficient, and less traumatizing than those constructed from haphazard mush bites and then made on a fixed articulator.

TECHNIQUES FOR OBTAINING JAW RELATIONSHIP RECORDS

1. Arbitrary Wax Rim Technique

Procedure.—This technique entails the construction of an upper and lower wax bite rim. The occlusal plane is established on the upper wax rim and the vertical dimension record is determined by soften-

ing the lower wax rim and having the patient close into this softened wax until proper vertical opening is obtained. The wax rims are then chilled, the excess wax removed, replaced in the patient's mouth, and the patient closes in a relaxed position. Vertical marks are placed on the buccal and labial aspects of the wax rims and further checks made to determine whether the patient is in centric relation. With centric relation established as evidenced by the vertical lines on the wax rims, the wax rims are fastened in this position and carried to the articulator and mounted. The wax rims are then returned to the patient's mouth and a double thickness of softened wax placed on the lower rim and the patient instructed to protrude the mandible about one-fourth of an inch and close. The wax rims and wax protrusive bite records are returned to the articulator and the horizontal condylar elements set for steepness.

Advantages.—The advantages of this procedure are outweighed by the inaccuracies introduced at the time these records are taken, such as: (*a*) inaccurately fitting baseplates, (*b*) underextended baseplates, (*c*) overextended baseplates, and (*d*) insufficiently heated wax. Al-

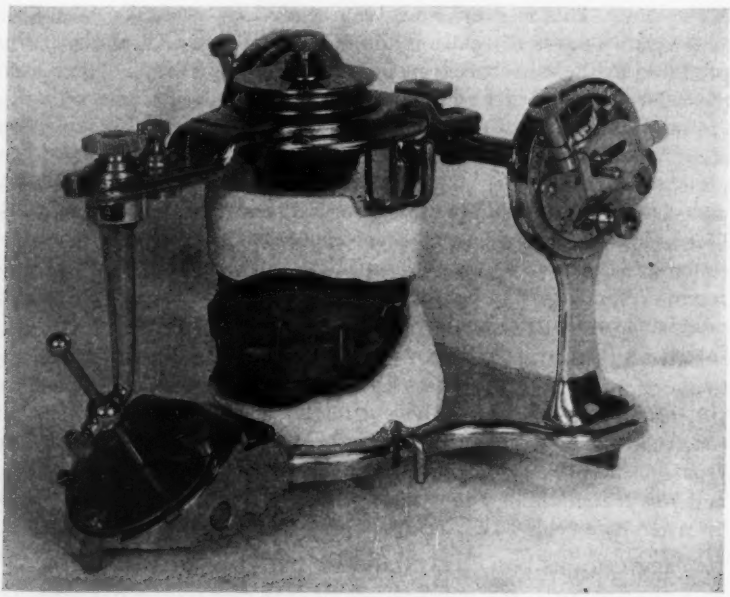


Figure 2.—Note defects in the baseplates and bite rims. The baseplates are not closely adapted to the casts. The posterior extremities of the baseplates are in contact. The lip contours were not established. The median line was not established. The centric lines in the posterior region are not well-defined.

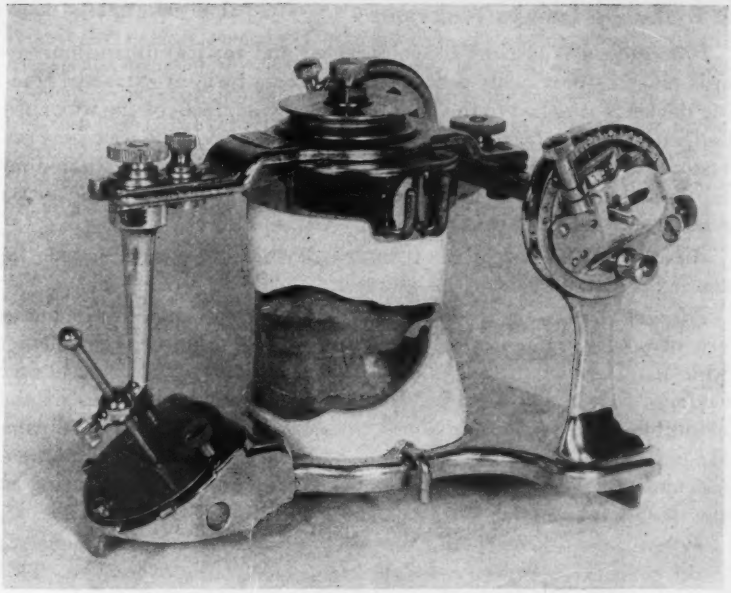


Figure 3.—These baseplates are accurately adapted to the ridges. The wax rims are neatly formed. The median line is established and lateral centric check lines are positive which facilitates their readability.

though the procedure is not time consuming, accuracy instead of speed should be the goal at this stage.

Disadvantages.—The disadvantages of this method are (*a*) uneven pressure and displacement of ridge tissues and tissues in the condylar region caused by unevenly heated wax and subsequent pressure thereon, contributing to an overocclusion in the finished case; (*b*) difficulty in getting the patient to relax and assume a true unstrained centric relation; (*c*) shifting the bases caused by the bulk of wax, poorly adapted baseplates, and uneven heating resulting in cuspal interference in the finished case (fig. 2); and (*d*) warpage of baseplates and subsequent shifting.

Precautions.—To obtain accuracy by this procedure, closely adapted reinforced baseplates are essential (fig. 3). Acrylic bases are preferable. A layer of soft wax placed on the occlusal surface of the wax rim at the time of establishing vertical dimension is advantageous in minimizing uneven pressures and shifting of the bases. The technique itself is contributory to carelessness because of its apparent simplicity.

2. Extraoral Tracing Technique

Procedure.—Wax rims are constructed and vertical dimension records taken as previously described, then some form of extraoral tracing device is attached to the labial and buccal surfaces of the wax rims and a gothic arch tracing is scribed by the patient. The wax rims are fastened together when the stylus of the tracing device is located on the apex of the gothic arch tracing. A reasonably accurate centric relationship record is thus obtained.

Advantages.—The chief advantage of this procedure is that the tracing is in plain view to the operator.

Disadvantages.—Anteroposterior and lateral displacement forces are introduced while having the patient scribe the gothic arch tracing. This displacement force is caused by the stickiness of the occlusal wax surfaces that are in contact during the various movements of the mandible. Uneven and bilateral pressures on the wax rims, during the centric and protrusive positions of the mandible, would compress the underlying tissues resulting in incorrect positional mounting in the articulator.

Precautions.—Wax should be softened uniformly and to sufficient depth to insure equalized pressure during the closing procedure. This is a most difficult step and entails the use of accurately fitting bases.

3. Intraoral Tracing Technique

Procedure.—Wax bite rims are constructed and the vertical dimension record established. A tentative centric relationship record is secured and the casts mounted on an articulator. A central bearing plate, with marking stylus, is attached to the upper occlusal wax rim. A central bearing plate, less stylus, is mounted on the lower wax rim after about 4 mm. of the lower wax rim has been removed. The stylus is then turned, in or out, until it contacts the lower tracing table in accordance with the vertical dimension maintained by the incisal guide pin of the articulator. The lower tracing table is coated with wax, carbon, or tracing ink. The wax rims, with intraoral tracing plates attached, are returned to the mouth and the patient instructed to generate a gothic arch tracing by moving the mandible anteroposteriorly and laterally. Light pressure should be maintained between the tracing plates during these movements. After an acceptable gothic arch tracing has been generated, the lower wax rim and tracing are removed from the mouth and a clear acrylic plate attached to the lower tracing table over the gothic arch tracing. The hole in the acrylic plate is placed directly over the apex of the gothic arch tracing. This will register the centric position of the mandible. The lower wax rim and tracing table are returned to the mouth and the patient instructed to close into the hole in the clear plastic disk.

Fast setting plaster is placed or injected between the base plates that record this centric record. The lower case is remounted with the aid of this plaster centric record. The lower wax rim and tracing table is returned to the mouth and the patient instructed to close into a second hole in the acrylic plate. This second hole is drilled 4 to 6 mm. directly posterior to the centric hole. Plaster is again injected between the bases. This record is used to set the condylar inclinations of the articulator (fig. 4).

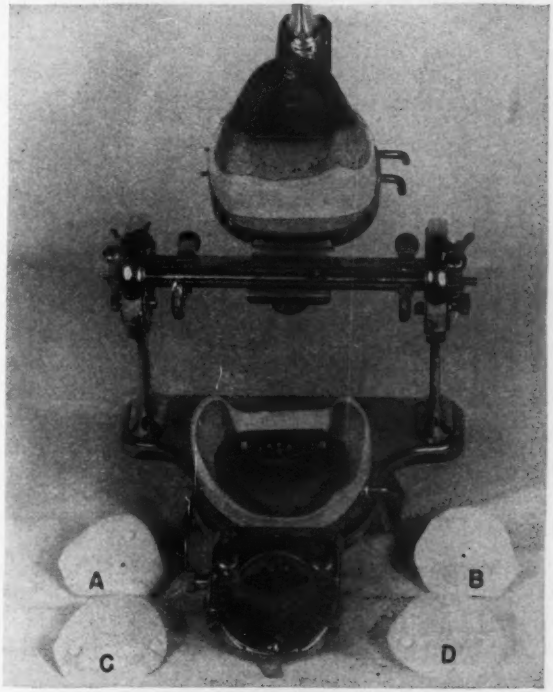


Figure 4.—Intraoral gothic arch tracing device. The four records obtainable are shown: (A) *Right lateral record,* (B) *left lateral record,* (C) *centric record, and* (D) *protrusive record.*

Advantages.—A gothic arch tracing is scribed with a minimum of lateral thrust and consequently a minimum of displacement of the underlying ridge tissues. The record is taken under central bearing point pressure that distributes the stresses more uniformly over the denture-bearing area. This limits lateral stresses and consequent error caused by shifting of the bases.

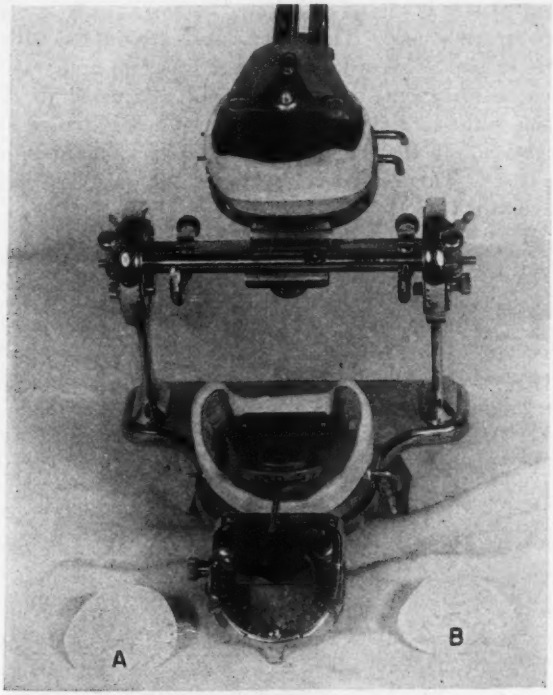


Figure 5.—One type of intra- and extra-oral gothic arch tracing device. Note blunt intraoral tracing stylus. (A) *Centric record, and* (B) *protrusive record.*

Disadvantages.—There is danger of the bases skidding on the tissues because the patient is locked in centric position in the hole of the acrylic plate. Unless the tracing stylus is mounted in the center of the denture-bearing area, there is danger of the closing pressure tipping the lower base.

Precautions.—Obtain a gothic arch tracing that has a definite apex and straight lateral sides. A gothic arch tracing with other than straight sides indicates that the heads of the condyles are not in their proper centric position. Have the hole in the clear plastic plate definitely located over the apex of the gothic arch tracing and securely attached to the lower tracing table. The coating on the lower tracing plate must be thin and evenly distributed so that a clear definite tracing will be produced and so that the clear plastic plate will seat without rocking. Steel marking ink is an adequate material for this purpose. Have the hole in the clear plastic plate accurately drilled and of the same size as the tracing stylus so that movement will not be possible.

Inspect for clearance between the bases in the heel sections. Have the tracing plates mounted so that they are parallel to avoid tipping when the patient closes the jaws. Grease the lower tracing plate to allow for easy movement of the tracing stylus.

4. Combination Intra- and Extra-oral Tracing Technique

Procedure.—The technique is the same as that of the two preceding methods except that they are combined. The intraoral tracing stylus is rounded to reduce frictional contact with the lower tracing plate and consequently to reduce shifting of the bases during the excursive movements of the mandible (figs. 5 and 6).

Advantages.—A gothic arch tracing is secured with a minimum of lateral thrust and consequently a minimum of displacement of the

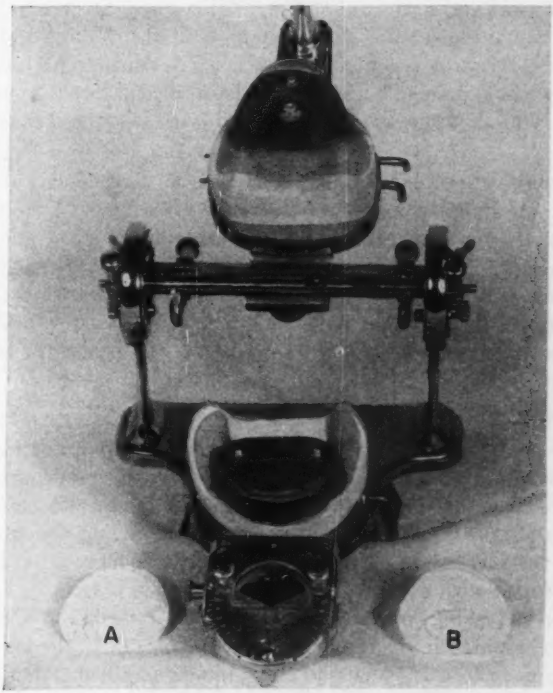


Figure 6.—A second type of intra- and extra-oral tracing device. The intraoral tracing stylus is blunt as shown in figure 5. The extraoral tracing device is a Gysi incisor path marker, with a fabricated metal tracing table. The three cone-shaped projections on the intraoral tracing device are used for reseating the plaster check bite records after these records have been formed. (A) *Centric record, and* (B) *protrusive record.*

underlying ridge tissues because a blunt intraoral stylus is used. The record is taken under central bearing point pressure which distributes the stresses more uniformly over the denture-bearing area. This limits lateral stresses and consequent error caused by shifting of the bases. The extraoral tracing device allows the patient to assume the centric position without being locked in this position while the plaster check bite is being taken. It also allows the operator a clear view of the tracing at all times; thus records of centric, protrusive, and lateral positional relationship may be verified at all times without locking the patient in these positions.

Disadvantages.—Tracing devices must be mounted so that the central bearing point pin rests in the center of the bases or there is a possibility of shifting of the bases while forming the gothic arch tracing. The intraoral and extraoral tracing devices are difficult to mount in cases in which the vertical dimension is limited. Mounting the intraoral and extraoral tracing devices is time consuming but may be delegated to a trained technician. The patient must manipulate a heavier, bulkier apparatus than is used with other techniques.

Precautions.—It is necessary to obtain a gothic arch tracing that has a definite apex and straight lateral sides. To be most effective and to eliminate lateral thrusts and subsequent shifting of the bases, the intraoral tracing stylus should be blunt in order that freedom of movement will be possible. Be certain that there is no interference between the bases in the heel sections. Well-adapted and accurately fitting bases are essential. Acrylic or vulcanite bases are preferable. The intraoral tracing plates must be greased to facilitate the separation of the plaster check bites.

5. NEEDLES' COMPOUND RIM TECHNIQUE

Procedure.—Wax rims and bases are constructed and the vertical dimension record established. A tentative centric relationship record is secured and the casts mounted on an articulator. A second set of bases is adapted to the casts, and compound rims are prepared to occupy the vertical dimension as established. The occlusal plane may be developed with a curved template to aid the patient in cutting the gothic arch tracings in the compound. Three triangular-shaped studs are then mounted in the upper compound rim: one in the anterior area and one in each of the bicuspid areas to extend about 2 mm. above the occlusal plane. The compound rims, with the studs attached to the upper rim, are returned to the mouth and the patient is instructed to chew in all excursions. This is continued until the original vertical dimension is obtained. This procedure will cut three cavities, each bounded by lines similar to a gothic arch and having a floor, the base of which is concave anteroposteriorly and laterally in conformity with

the paths traveled by the condyles (fig. 7). The compound rims are removed from the mouth and assembled so that the cutting studs are accurately seated in the anterior apices of the three gothic arch cuts. This is the centric relationship record. The lower cast is remounted with the aid of this record. The articulator is manipulated into lateral positions so that the three studs seat simultaneously on the floors of the gothic arch cuts. This procedure allows the operator to set the condylar elements of the articulator for condylar inclination, incisal guidance, and Bennett movement.

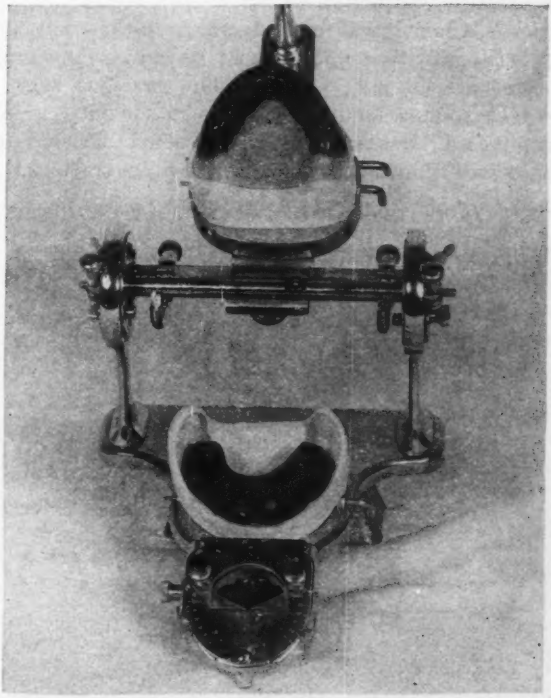


Figure 7.—Dr. Needles' compound rim device showing tracing studs and cavities cut in the lower compound rim.

Advantages.—The condylar readings may be taken directly from the compound rims after the arrow-point tracings have been made, obviating the use of plaster records for this purpose. The apices of the three arrow-point tracings represent a positive centric relationship record. The curved floors of the arrow-point tracings that are cut in the lower compound rim bear a positional relationship to the horizontal inclination of the eminentia articularis that will permit

the operator to set the condylar guides of the articulator in an equivalent position.

Disadvantages.—The resistance to the three tracing studs offered by the lower compound rim may cause a lateral shifting of the bases and consequently contribute to an inaccurate record. The time element involved in chewing in the arrow-point tracings is lengthy. Patients with weak uncoordinated musculature may experience difficulty in cutting adequate arrow-point tracings. The procedure is quite messy from the standpoint of loose compound chips and debris that collect in the mouth during the operation.

Precautions.—Cutting studs must be sharp so they will cut the arrow-point tracings with a minimum of resistance. Accurate, well-adapted bases are essential. Arrow-point tracings must be well defined with sharp apices in order to contribute to an accurate centric relationship record. Patients must be instructed to chew rather than chop or holes will be made instead of arrow-point tracings.

TECHNIQUE ADVOCATED AND SERVICE RENDERED

To provide a technique for making more functionally accurate dentures, the following procedures were established, as an additional

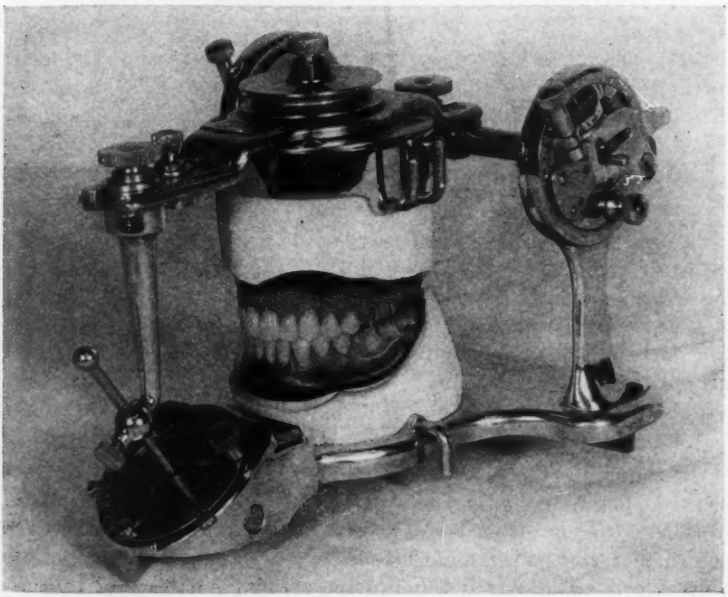


Figure 8.—Tentative set-up of the 12 anterior teeth and bicuspids on the original bases.

service to stations in the Fifth Army Area, by the Central Dental Laboratory.

STAGE I

Station procedure.—Impressions are taken, bite rims are constructed and vertical dimension records established in accordance with modern accepted procedures. Proper mold and shade of teeth are selected and the case is mailed to the laboratory.

Laboratory procedure.—The cases are keyed and are then mounted on an articulator. The anterior 12 teeth and bicuspids are set in position in the original wax rims in conformity with existing ridge relation (fig. 8). A second set of acrylic base plates are made. Intraoral tracing plates are correctly located and attached to these acrylic bases. The tracing stylus is turned up or down so contact with the lower tracing plate is made at the same time that the incisal pin of the articulator contacts its guidance. The lower tracing plate is coated with steel marking ink. A small vial of marking ink and brush are sent to the station with the set-up so that in case of error the plate may be repainted. A clear acrylic plate, with one hole drilled, also accompanies the case. A suitable container accompanies the trial set-up in which the operator places the plaster check bites when returning the case to the laboratory.

STAGE II

Station procedure.—The trial set-up is tried and critically judged for accuracy as to appearance, vertical dimension, and horizontal and vertical overbite. Any changes necessary are made at this time. The bases with the tracing plates mounted thereon are placed in the patient's mouth and an arrow point tracing is generated. If the arrow point tracing is accurate as to a definite apex and straight lateral lines, the clear acrylic plate is luted to position over this tracing with the hole in the plate directly over the apex of the tracing. The bases are returned to the mouth and the patient is instructed to relax the mandible and close the jaws with the stylus seated in the hole in the acrylic plate. This gives the centric relationship record. A quick setting plaster is injected between the tracing plates or placed on the lower tracing plate prior to placing in position. This plaster check bite is marked "Centric relationship record." A second hole is drilled in the clear acrylic plate about 6 mm. distal to the first hole. This second hole, when recorded, gives the protrusive relationship record. The bases are again returned to the mouth and the patient instructed to protrude the mandible until the tracing stylus seats in the posterior hole in the clear acrylic plate. Fast setting plaster is again injected between the tracing plates or placed on the lower tracing plate prior to placing in position and this is recorded. This second

plaster check bite is marked "Protrusive relationship record." If the station desires to carry this procedure a step further and obtain the maximum in balanced occlusion two lateral plaster check bites are obtained. Two holes, one on either arch of the gothic arch tracing, about 6 mm. from the centric hole, are drilled in the plastic plate on the lateral lines of the tracing. Fast setting plaster is again injected as previously described. The trial set-up and plaster check bites are boxed and mailed to the laboratory.

Laboratory procedures.—The bases with the tracing plates are assembled with the centric plaster check bite and the lower case is remounted in the articulator (fig. 9). The protrusive and/or lateral plaster check bites are assembled between the bases and the condylar guidances of the articulator set to conform to these records. If lateral plaster check bites were taken, the case would be constructed on either a House or Stansbery articulator. The remaining teeth are set in position and articulated in accordance with lateral and protrusive movements generated by the articulator as set by the plaster check bites. The cases are waxed to anatomic requirements. The cases are split

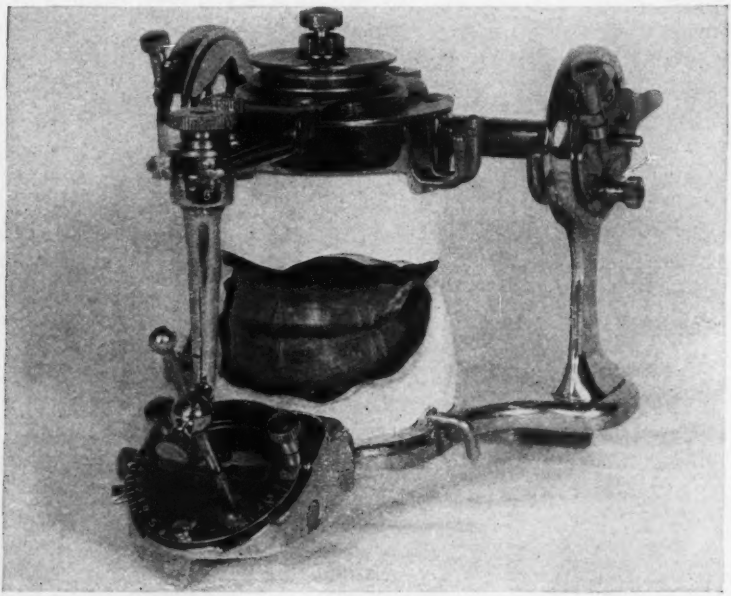


Figure 9.—Original bite rims placed in position on the casts after the lower case was remounted from the plaster check bite centric record. Note anteroposterior and lateral positional relationship error and separation of rims on the left side of the arch. This case probably would have to be reconstructed.

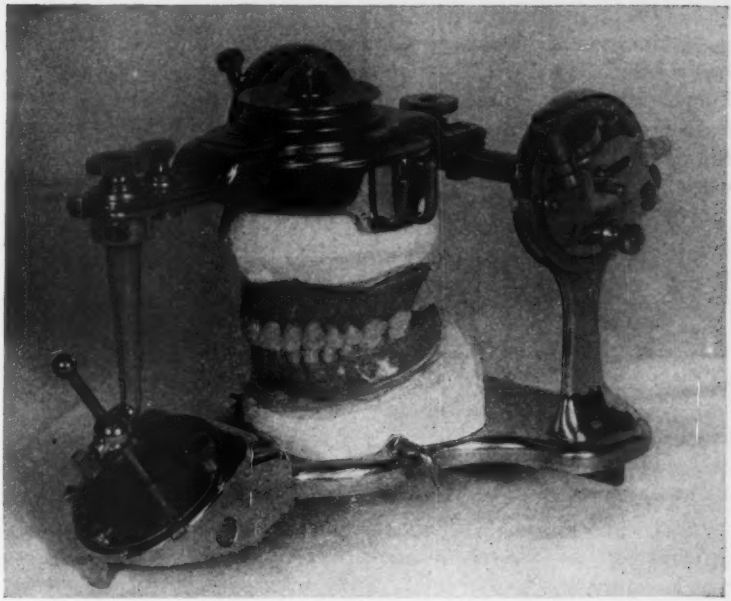


Figure 10.—Dentures fabricated on casts mounted in the articulator with the aid of an accurate plaster centric check bite record. These dentures have been worn for 8 months with only one post-insertion adjustment.

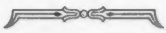
from the articulator, flasked, packed, and processed. Since the casts were keyed prior to mounting the case in the articulator, the casts are reclaimed from the flask and remounted in the articulator for discriminate and selective spot grinding and the occlusion further refined by judicious milling-in on the instrument. This milling-in should be considered a preliminary refinement of the occlusion in that the main object is to remove processing errors (fig. 10). A wax check bite, and remounting of the case for further milling should be accomplished after the dentures have been in service for several days.

Accurate centric relation and balanced functional occlusion are incorporated in full dentures constructed as here described. Such dentures will be free from all cuspal interference, and will eliminate many time-consuming post-insertion adjustments.

CONCLUSIONS

The principle of gothic arch tracings should be incorporated in the fabrication of more functionally accurate full dentures. The time saved on post-insertion adjustments together with the comfort and masticating efficiency the patient will enjoy, more than compensate

for the few additional minutes involved in obtaining centric and lateral check bite records. The bare minimum in technical procedure should include some form of the gothic arch principle if for nothing more than obtaining an accurate centric relationship record. This is essential since prosthodontists are charged with delivering to the patient the maximum in professional judgment and technical skill that modern dental science has to offer.



Para-aminosalicylic Acid Resistant "Mycobacterium tuberculosis"

Incidence in Cases Treated at Fitzsimons Army Hospital

WILLIAM E. DYE, *First Lieutenant, U. S. A. F. (MSC)*[1]
ELEANOR H. GOGLEY[1]

THE increased in vitro resistance to para-aminosalicylic acid (PAS) of *Mycobacterium tuberculosis* isolated from patients receiving the drug has been reported by several investigators (*1*) (*2*) (*3*) (*4*). This increase in in vitro resistance has been associated with loss of therapeutic effect of the drug in animal experiments (*5*).

This article presents the incidence and degree of in vitro resistance to PAS observed in cultures of *Myco. tuberculosis* isolated from patients treated at Fitzsimons Army Hospital. No attempts will be made here to correlate clinical response, toxicity, or pathology with development of bacterial resistance.

METHODS

Detailed procedures for performing PAS sensitivity studies on *Myco. tuberculosis* are presented elsewhere (*6*). Cultures of *Myco. tuberculosis* were isolated in the usual manner, subcultured in liquid media, and then on a modified Herrold's egg-yolk agar containing 0, 1, 10, and 100 micrograms per milliliter of para-aminosalicylic acid (as the sodium salt). The sensitivity studies were evaluated after a 10- to 14-day incubation. Growth on the control tube was arbitrarily considered as 4 plus and growth on the other tubes evaluated in terms of the control. One to twenty-five percent growth on the control tube was reported as 1 plus, 26 to 50 percent growth as 2 plus, 51 to 75 percent growth as 3 plus, and more than 75 percent growth as 4 plus.

RESULTS

PAS sensitivity studies were performed on one or more cultures from 303 patients who had not received the drug. Minor variations in sensitivity were observed with different strains of *Myco. tubercu-*

[1] The Laboratory Service and the Research and Development Branch, Fitzsimons Army Hospital, Denver, Colo.

losis and with different cultures from the same patient. The majority of the cultures produced from 0 to 3 plus growth on the 1-microgram per milliliter tube. A few produced as high as 4 plus growth on the 1-microgram per milliliter tube with a few colonies on media containing 10 micrograms of PAS per milliliter. In the absence of specific therapy, no increase in in vitro resistance was observed.

The results of the sensitivity studies of the first 37 patients to receive PAS therapy for 120 consecutive days at Fitzsimons Army Hospital are shown in table 1. Cultures from 6 of these patients were highly resistant to streptomycin. Because of the variation in growth on the 1-microgram per milliliter tube, only values on the control, 10- and 100-microgram per milliliter tubes were used to compile this table.

TABLE 1.—*Analysis of in vitro resistance studies on* Mycobacterium tuberculosis *isolated from 37 patients receiving 120 consecutive days of PAS therapy*

Patient	Total daily dosage (grams)	Number of days after beginning therapy						
		0–30	31–60	61–90	91–120	121–150	151–180	181–240
1	7.2	S	S	S	R(10)	R(10)	R(10)	S
2	7.2	S	N	N	N	N	N	N
3	7.2	S	P	S	S	S	S	S
4	7.2	S	S	S	R(100)	R(100)	R(100)	R(100)
5	8.4	S	S	S	P	S	S	S
6	9.6	S	S	S	S	S	P	ND
7 [1]	9.6	S	P	S	P	R(100)	R(10)	S
8	9.6	S	N	S	S	S	S	S
9	9.6	S	S	N	S	S	S	S
10	9.6	S	S	S	R(10)	R(10)	N	N
11	9.6	S	S	S	R(100)	R(100)	R(100)	R(100)
12 [1]	9.6	S	S	S	R(100)	R(100)	R(100)	R(100)
13	9.6	S	P	S	S	N	N	N
14	10.0	S	S	S	S	R(10)	R(100)	R(100)
15	10.0	P	S	S	S	R(10)	R(10)	R(100)
16	10.0	P	S	R(100)	P	R(100)	R(10)	P
17	10.0	P	N	S	R(10)	R(10)	R(100)	P
18 [1]	10.0	S	S	S	R(10)	R(10)	ND	ND
19	10.0	P	S	N	N	S	N	N
20	10.0	S	S	S	S	ND	ND	S
21	10.8	S	S	S	R(10)	R(100)	S	S
22	10.8	S	P	S	S	S	S	N
23	10.8	S	S	S	P	S	S	S
24	10.8	S	S	R(10)	R(10)	P	R(10)	S
25 [1]	10.8	S	S	R(10)	R(100)	P	R(10)	P
26	10.8	S	S	R(10)	R(10)	S	S	S
27	10.8	S	S	S	S	R(10)	R(10)	R(100)
28	10.8	S	N	N	N	N	N	N
29	10.8	S	N	N	N	N	N	N
30	10.8	P	S	N	N	N	N	S
31 [1]	10.8	S	S	S	R(10)	S	S	S
32	12.0	S	S	N	N	N	N	N
33	12.0	S	N	N	N	S	S	P
34	12.0	S	N	N	P	P	S	S
35	14.4	S	S	S	S	R(100)	R(10)	R(10)
36	14.4	P	S	S	R(100)	R(100)	R(10)	S
37	14.4	S	S	N	N	N	N	N

Explanation of code letters:

S—Cultures whose sensitivity studies showed no growth on the 10-microgram per milliliter tube.

N—Negative cultures during period of evaluation.

R( )—Cultures whose sensitivity studies showed growth comparable to the control tube on the tube shown in parentheses following the symbol.

P—Positive cultures during period of evaluation, but no sensitivity study was performed because of contamination or insufficient material.

ND—No sputum submitted for culture during period of evaluation.

[1] Streptomycin-resistant

Analysis of table 1 reveals that 19 of the 37 patients yielded cultures resistant to 10 or more micrograms of PAS per milliliter during or after therapy. Seven of these patients now yield only cultures which are sensitive to PAS. In this series of patients there is no apparent correlation between total daily dosage or previous loss of streptomycin sensitivity and incidence of bacterial resistance to para-aminosalicylic acid.

DISCUSSION

Additional PAS regimens are being investigated in the hope of delaying or preventing the emergence of bacterial resistance. Comparison with the data reported here will indicate the relative efficacy of these new regimens. At the present time the simultaneous use of PAS with streptomycin or other antituberculosis agents is receiving intensive investigation. Preliminary results (*7*) (*8*) show that the incidence of bacterial resistance to both drugs is greatly reduced by the practice of combined therapy. Intermittent administration of PAS alone, or preferably in combination with streptomycin, promises to delay the emergence of bacterial resistance compared to the rate with similar daily dosage regimens.

Bacterial resistance to PAS does not appear to be as permanent a phenomenon as loss of streptomycin sensitivity.

SUMMARY

Cultures of *Myco. tuberculosis* from 303 patients who had not received para-aminosalicylic acid were uniformly sensitive to the drug. In vitro resistance to 10 or more micrograms of PAS per milliliter developed in cultures from 19 out of 37 tuberculous patients who received from 7.2 to 14.4 grams of the drug daily for 120 consecutive days.

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Bone Grafting in Saddle Nose

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THE saddle-nose deformity is one of the common defects found in patients complaining of impaired nasal respiratory function. It is caused by a variety of conditions, including: deformity resulting from faulty or extensive submucous resection; infection, with resultant absorption of septal cartilage; trauma; syphilis; cancer; roentgen therapy; and sequela to metabolic diseases. Submucous resection or trauma are the most prevalent factors in deformity.

Bone grafting cannot be done when inflammation or active disease is present. As in other types of deep grafting, the nasal dorsum must be free from cicatrix and an adequate soft tissue cover must be present.

In evaluating a saddle-nose deformity, attention should be paid, first of all, to the nasal airways. If the nasal septum is deviated and obstructs breathing, a submucous resection should be performed prior to correction of the nasal dorsum. Often the nasal bones are deflected from the center line. An alinement of the nasal bones is done in a preliminary operation before the correction of the saddle defect.

There are several available sources of material suitable for use in the correction of the saddle-nose deformity. Autogenous cartilage from the fused portion of the ribs provides a very satisfactory type of graft. Disadvantages of this cartilage are: (*a*) a tendency for the upper end of the graft to curl, and (*b*) softening of the dorsal strut over a period of time. Preserved cartilage has been used extensively and provides easily obtained material. It is particularly useful in correcting small defects. In more extensive cases the graft fails to maintain its dorsal support and moderate depression results.

Bone grafts have been found to maintain their contour and to provide the necessary support to the nasal dorsum. A satisfactory graft may be secured from the ribs, but an easy and ample source is cancellous bone from the iliac crest. This type of bone graft takes well, is resistant to infection, and is readily shaped to fit the nasal dorsum. The graft is taken in one piece as shown in figures 1, 2, 3,

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and 4. The bone is shaped as a rudder of a boat, and provides a straight nasal dorsum and a right-angle columella strut (fig. 4).

TO OBTAIN THE GRAFT

The patient is given spinal anesthesia and the skin over the iliac crest is prepared for operation. An incision is made down through the periosteum, exposing the crest (including the anterior portion). The periosteum of the crest is elevated and a segment of bone about 2 inches in length is exposed. The crest is cut straight with a Stryker vibrator saw (fig. 1). A major portion of the cortex is removed, leaving a small portion for strength. The block graft is further cut by outlining the sides and ends of the graft to the depth of the saw. With a broad flat chisel, convergence is obtained by bringing the chisel cuts together at a depth of 1 inch (fig. 2). The graft is rocked free from its attachment and lifted out (fig. 3). The cortex of the donor area is fractured to fill the dead space. The wound is closed in anatomic layers and pressure dressings applied.

SHAPING THE GRAFT

The graft is placed on a wood block, held firmly in position, and cut to pattern. The dorsum of the graft is rounded and a columella strut is shaped in the form of a rudder on a boat (fig. 4). A small bit of cortex is left on the anterior surface of the columella strut

Figure 1.—Obtaining the graft. The crest of the ilium has been exposed and periosteum removed from area of graft.

Figure 2.—The bone block has been cut to the depth of 1 inch. Chisel cuts converge to free the block.

Figure 3.—Cancellous bone block lifted out of iliac crest; shows straight dorsum of graft and converging lower edge.

Figure 4.—The shaped graft, showing straight dorsum and columella strut.

for strength. The strut is thinned down to fit in between the medial crura of the lower lateral or alar cartilages. A groove is cut on the under surface of the long arm of the graft to reduce weight and give a greater growing surface. All cutting is done with the Stryker saw. This vibration saw is quite accurate and facilitates precise cutting.

RHINOPLASTIC TECHNIQUE

The face and nose are prepared for operation. Procaine anesthesia, two percent solution with six drops of adrenaline per ounce, is injected at the base of the columella in the mucosa of the marginal area of the nose. Anesthesia of the nasal pyramid is obtained by intradermal wheals raised at the junction of the bony and cartilaginous dorsum, one on each side of the ala. Through these wheals, walls of anesthesia are created, blocking afferent nerve supply of the nasal region; other injections are carried through the nasal tip. With a 2-inch needle, areas of anesthesia are laid from the glabella to the tip and on each side of the nasal framework. The mucosa of the nose may be anesthetized with cocaine and adrenaline mixture, but it is usually not necessary. Loose packs of gauze are placed in the nose.

An incision is made transversely in the columella about one-fourth of an inch above the lip (fig. 5). The incision is carried down to

Figure 5.—The line of incision for the columella flap is carried down to the columella cartilage. Intramarginal incisions are carried upward on each side of the columella in the mucosa.

Figure 6.—Columella flap elevated. The leaves of the medial crura of the lower lateral cartilages are separated by blunt dissection down to the nasal septum. The dorsum of the nose is undermined and the periosteum over the dorsum nasal bones elevated to provide contact of the bone graft with bone.

the columella cartilage. Intramarginal incisions are then carried upward on each side of the columella in the mucosa. The columella flap is then elevated and dissected free from the medial crura of the lower lateral cartilages (fig. 6). This incision is practically invisible after healing because the shadow of the tip obscures the line.

With blunt scissors the soft tissue is freed over the nasal tip and lateral portions of the lower lateral cartilages. The soft tissue over the upper lateral cartilages is freed to release the depressed area and provide more room for the graft. The scissors are then carried over the nasal bones and straight to the root of the nose. A tunnel is formed. The periosteum is elevated over the dorsal ridge of the nasal bones and the radix nasi; this permits the bone graft to seat directly in contact with the bone. The columella is then undermined to the anterior nasal spine; this permits seating of the columella strut directly on bone.

Figure 7.—Shaped bone graft ready for insertion into the dorsum of the nose.

A trial of the graft is then made and further adjustments on the graft performed. When a satisfactory fit is determined the graft is inserted in the prepared pocket (fig. 7) and the columella flap brought down into position. The flap is sutured with No. 00000 in-

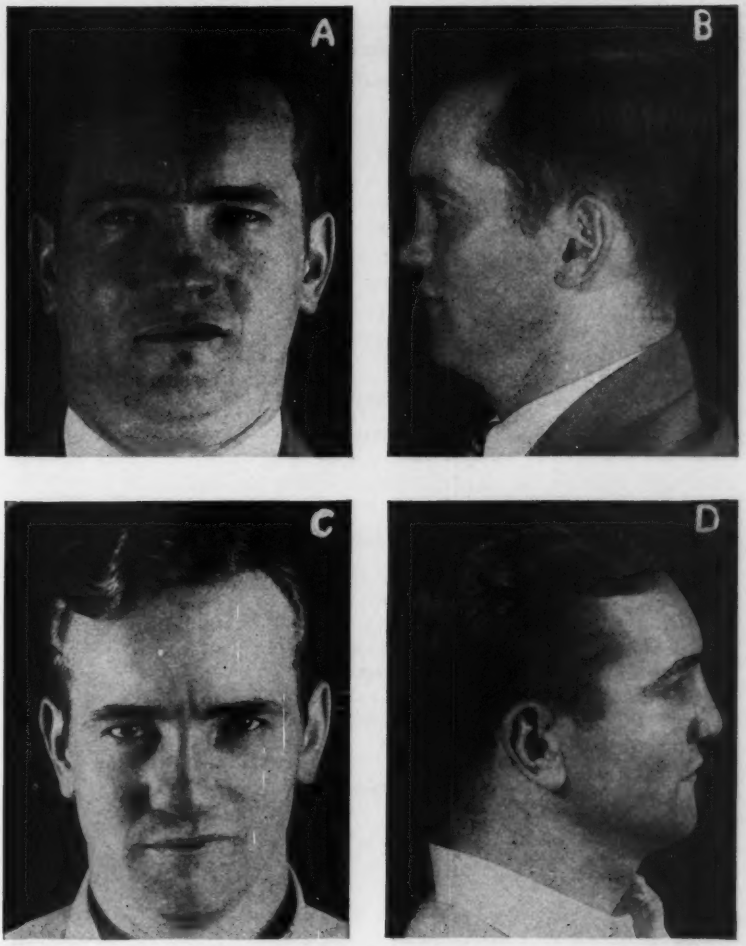

Figure 8.—Case 1. (A) *and* (B) *Preoperative appearance, the result of nasal fracture.* (C) *and* (D) *Postoperative appearance. The nasal deformity has been corrected by an iliac crest cancellous bone graft in one continuous piece for the dorsum and columella. The contour is improved and the airways adequate.*

terrupted nylon sutures. The marginal incisions are closed. Nasal packs are placed lightly in the nostrils. Compound tincture of benzoin is used to cover nose, upper lip, and cheeks. A piece of soft cloth is cut to fit the nose. Adhesive strips, ⅜ inch by 6 inches, are used to cover the dorsum of the nose and hold the graft in position. As the tapes go into position, blood and swelling is milked from the nasal

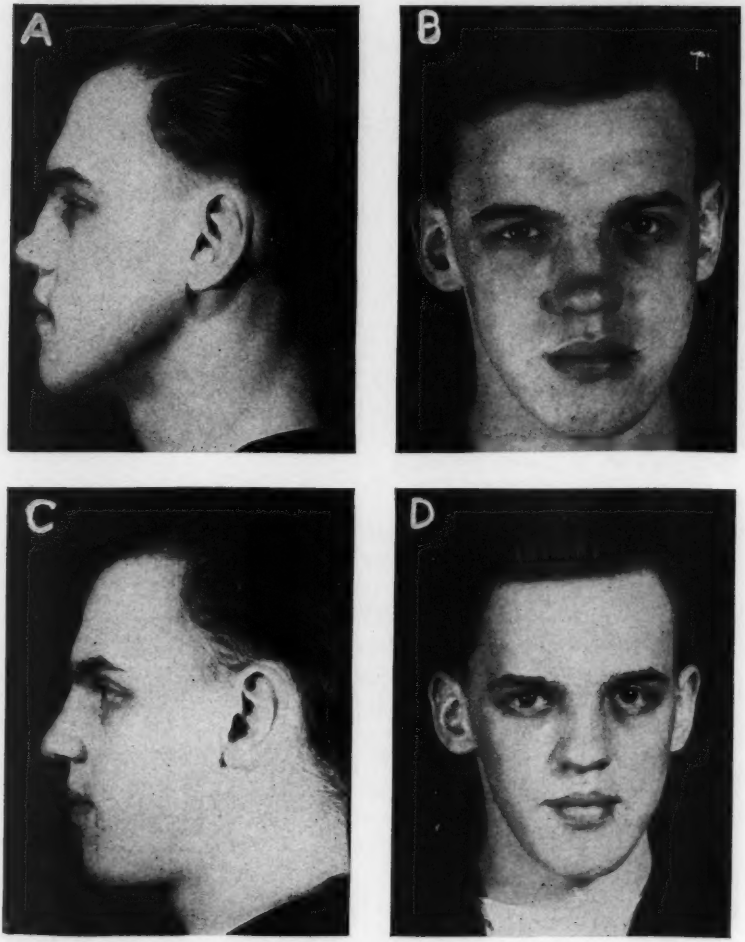

Figure 9.—Case 2. (A) *and* (B) *Preoperative appearance, congenital saddle nose.* (C) *and* (D) *Appearance after deformity had been corrected with cancellous bone graft.*

dorsum and strips of tape are brought around the under surface of the nose to reduce the width of the ala and increase the height of the nose.

Modeling compound is fitted over the nose, using the adhesive tape as a base. The compound is similarly secured with narrow adhesive tape to the nose and face. Particular attention is paid to bringing in the sides of the splint with adhesive tape to reduce the width of the

alae. The patient is placed on penicillin therapy for 6 days. Packs are removed in 48 hours. The nasal splint is removed in 7 days.

Figures 8 and 9 show preoperative and postoperative appearance of two patients.

CONCLUSION

Bone grafts to correct saddle-nose deformities can be secured in sufficient quantity from the iliac crest. These grafts are resistant to infection and provide a stable, easily worked material. Bone grafts hold the contour of the nasal dorsum more accurately than cartilaginous grafts. There is very little contracture and practically no loss of substance in the graft. The percentage of "takes" is uniformly good.

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Prosthodontia in Diastema

W. IRWIN GULLETT, *Lieutenant Commander (DC) U. S. N.*[1]

AN EXAMPLE of using prosthetics to correct a fault that ordinarily would have to be corrected surgically or by orthodontics is presented.

CASE REPORT

A routine dental check-up of a 33-year-old officer revealed a very wide diastema between the upper central incisors (fig. 1). He had discussed this anomaly with dentists from time to time but none had offered any hope of correcting the defect.

The space between the incisors (using a Boley gage) measured 5.4 mm.; the width of the central incisors was 8.4 mm. This gave a combined space of 22.2 mm. To put three teeth in the space instead of the two that were there, each tooth would have to be 7.4 mm. wide. This would be 0.6 mm. narrower than the narrowest average central incisor.[2] It appeared possible to accomplish this and have an agreeable end result.

The first step was to take full-mouth impressions and run up some models in stone. The central incisors were then roughly prepared on the models as they would be if plastic jackets were going to be made. Blue casting wax was then applied to the pegs and a complete wax bridge was carved, filling the space across the anterior region. This step of constructing study models is very important before undertaking difficult and unusual cases because it indicates whether the end result will be satisfactory. From the model it was apparent that the space would take three teeth and give a good esthetic result.

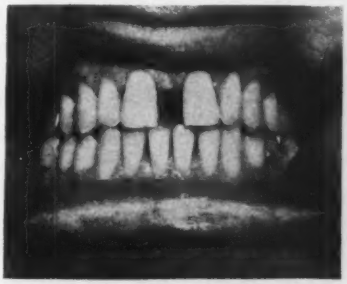

Figure 1.—Wide diastema between upper central incisors.

Full jacket preparations were cut on the two central incisors (fig. 2); copper band impressions taken of the two preparations, and a full upper impression in "hydrocolloid" was made. The copper band impressions were then poured up in amalgam; the resulting dies were inserted in the "hydrocolloid" impressions and the whole poured in stone. The shade, both incisal and gingival was carefully selected at this time.

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[1] U. S. Naval Air Station, Lakehurst, N. J.

[2] BLACK, G. V.: Descriptive Anatomy of the Human Teeth.

Figure 2.—Full jacket preparation of upper central incisors.

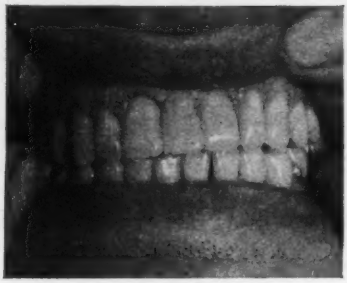

Figure 3.—End result.

The ridge between the incisor preparations was next relieved on the cast. Blue casting wax was then applied and the bridge, which consisted of two jackets and the middle dummy, carved. The usual procedures were followed in the curing and finishing of the all-acrylic bridge.

The end result (fig. 3) was very gratifying to the operator and the patient thereby became psychologically better fitted to perform his duties.

Exfoliative Cytology Service in an Army Hospital

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JANICE SUPER, *B. A.*[1]

THE method of exfoliative cytology first introduced by Papanicolaou for the diagnosis of cancer has found wide application. Its main value lies in its potentialities of diagnosing cancer in parts of the body ordinarily inaccessible and also in the detection of cancer in the subclinical phase. Its value in the diagnosis of bronchogenic cancer by sputum and bronchial aspiration is now well-established. Although the recognition of cancer cells in pleural and abdominal fluids, gastric washings, urine, and prostatic secretions is more difficult, the number of cases detected justifies the use of this method. A recent modification of the procedure has increased the percent of cases diagnosed from examinations of gastric washings.

ORGANIZATION

The fundamental factor for the detection and final diagnosis of cancer is the continued observation of the patient and close collaboration of the attending physician, pathologist, and cytologist. In an Army hospital, where both patients and staff are subject to transferals, certain measures are necessary to insure the follow-up of each patient. In each department concerned with the various phases of the detection and diagnosis of cancer, in addition to the patient's clinical record, a special index is maintained in which every transfer of the patient is registered. Notification for a follow-up examination is sent either to the patient or to both the patient and the attending physician at the Army hospital nearest the patient's new address. This is particularly important in cases in which there are cells in the smear of equivocal nature and also in patients who require periodic examinations extending over months or years. The same applies to patients in whom a positive smear was followed by a negative biopsy report and repeated smears and biopsy examinations were advisable. All doubtful cases are reviewed and discussed with a consulting cytologist.

[1] Oliver General Hospital, Augusta, Ga.

PROCEDURE

Exfoliative cytology was used at this hospital for the past 2 years as a part of the routine physical examination of all patients; the patient not knowing for what purpose this examination was being made. At no time was it referred to as a "cancer test" in the presence of the patient. It was used as a screening test for the detection of early, clinically unrecognizable cancer in women without gynecologic symptoms, as well as in women who presented some specific complaint and in cases of suspected cancer in parts of the body other than the cervix uteri. For the detection of cervical cancer the equipment consists of swabs, numbered slides, and cards for adequate informative history on one side, the other side being used for the pathologist's report. The fixative consists of equal parts of 95 percent alcohol and ether in Coplon jars. These are placed in wire baskets throughout the hospital.

METHOD

A swab is inserted about one-half inch into the cervical canal and the junction of the squamous and columnar epithelium is carefully swabbed. The applicator is then rolled onto a clean glass slide and immediately placed in the fixative before drying has occurred. The smears should be fixed for at least 10 minutes and may remain in this solution up to a week, after which they are stained by a modification of Papanicolaou's procedure and mounted with clarite. Douching or bathing, preliminary pelvic examination, or the drying of the smear before fixation, are avoided. Performance of any one of these procedures may affect the characteristics of the secretions and may cause distortion of the cells. A screening technician systematically examines the entire slide of each vaginal and cervical smear, and marks the slides for further study by the pathologist. The interpretation of the slide requires extensive knowledge of exfoliative cytology. The appearance of the entire slide is important as the presence of erythrocytes or leukocytes, evidence of physiologic changes, pregnancy, radiation, and/or the menopause, should all be considered.

Smears from other body fluids are made when the symptoms suggest the presence of cancer in a part of the body inaccessible to other diagnostic procedures, or in a patient in whom metastatic cancer requires a search for the primary lesion. The sputum is collected in a jar containing 70 percent alcohol and sent to the laboratory. Bronchial aspirations are placed in 95 percent alcohol and sent to the laboratory. The first specimen of gastric fluid should be the fasting gastric content aspirated through a size 14 Levin tube, after the patient has drunk water. When the stomach has been emptied, it is washed by forcibly injecting 100 cc. of saline solution, aspirating,

reinjecting and aspirating a few times. During this procedure the patient should change position several times and be allowed to get up and walk. The saline washings constitute the second specimen. The sediment from pleural and abdominal fluids is mixed with a double volume of 95 percent alcohol and sent to the laboratory. Prostatic secretion obtained by prostatic massage is collected in a container or on a clean slide which is fixed in ether-alcohol or 95 percent alcohol and sent to the laboratory. Catherized urine is mixed with an equal volume of 95 percent alcohol and sent to the laboratory. All centrifuged sediments are placed on slides previously spread with Mayer's albumin glycerol. Smears of all body fluids are fixed for 1 hour in equal parts of 95 percent alcohol and ether and stained by the Papanicolaou method or with hematoxylin and eosin.

Since the adoption of this method, it was possible to detect cancer that would have otherwise remained unrecognized because other diagnostic procedures gave negative results. The final diagnosis of cervical cancer is never made from exfoliative cytology alone. When abnormal cells or cells with malignant characteristics are seen, another smear is usually obtained just prior to obtaining a specimen for biopsy, endocervical curettage, and endometrial scraping. Each positive smear must be confirmed by paraffin sections from cervical specimens for biopsy before a diagnosis of cancer is made. When the biopsy report is negative in the presence of a positive smear, the patient should be observed by repeated smears, preferably taken during the luteal phase. If subsequent smears are positive, additional specimens for biopsy are obtained. Following a tentative diagnosis by exfoliative cytology in the presence of a negative biopsy report, repeated smears are indicated, and, before clearance is given, at least three smears should be free of cancer cells.

RESULTS

In the past 2 years about 6,000 patients were examined by this method and 35 cases of unsuspected cancers were detected. We believe that these results justify the use of this procedure as a part of the routine physical examination.

DISCUSSION

Exfoliative cytology is of value in the detection of preinvasive cancer of the cervix and as an adjunct to the diagnosis of cancer in other parts of the body. To train technicians to read the slides requires a minimum of 6 months' instruction, preferably in a recognized cytologic center where a large volume of material is available for study. This should be followed by extensive practice. Any training period

shorter than this gives the technician a false sense of security and may do more harm than good. Since it is impossible for the pathologist to examine all slides, screening technicians are essential. All abnormal cells are marked for the pathologist, thereby reducing the time required for his examination of the slides. Technicians are divided into those trained to make a preliminary screening of all abnormal cells and more highly qualified technicians who are able to differentiate various types of atypical cells. More extensive training would be required to enable the technician to recognize changes caused by neoplasia, inflammation, erosions, radiation, metaplasia, polypi, pregnancy, and other conditions. Histiocytes, and atypical cervical and endocervical cells produce abnormal conditions that may be confused with cancer. The knowledge of such changes reduces the incidence of erroneous interpretations.

Penicillin, an Allergic Hazard

ROBERT L. GILMAN, *Captain (MC) U. S. N.*[1]

THE increase of reactions from penicillin is as real as it is apparent; and the gravity of the reactions is increasing. The familiar urticaria which formerly amounted to little more than cutaneous discomfort is now being replaced in many instances by reactions more profound; reactions that simulate the serum sickness of former days and suggest that an anaphylactoid phenomenon with all that it portends has made its appearance.

Reactions that now appear after a definite presensitization and that follow after a longer refractory period are characterized by chills, fever, prostration, arthritic symptoms, and shock. Recovery is prolonged and subsequent exacerbations may follow. It can readily be postulated that serious allergic manifestations are significantly present while morbid and irreversible changes in the collagen reticuloendothelial structure can follow. The era of mild acceptable nondisabling postpenicillin reactions is changing to include these graver complications.

To explain these more serious reactions on the grounds of the complex protein of the mold substance, or to a lessened sensitivity on the part of the infections treated is tempting. However, in view of the widened and *indiscriminate* use of penicillin one must concede the guilt of usage rather than substance. A reappraisal of the therapeutic use of penicillin and a thorough rationalization of every dose—and amount—should be undertaken. We must abandon the thought current in some quarters that this antibiotic is a cure-all or that its prophylactic use is justified. Not only is the routine use before all operations, dental as well as surgical, unsound, but the facility with which it is administered for almost every complaint for which there is no apparent infectious cause needs to be halted. The absurdity of treating "nervous headaches" or vague fatigue with the drug quickly leads to its use for complaints which even the sketchiest history would have disclosed as fully developed *penicillin reactions!*

[1] U. S. Naval Hospital, Philadelphia, Pa.

In penicillin we do not have the sovereign remedy; all things will not yield to it; it has failed to become the substitute for the thought and drudgery necessary to evaluate the patient's complaints.

Spontaneous Pneumothorax

Observations on Twenty-six Cases

ROBERT K. MOXON, *Lieutenant (MC) U. S. N.*[1]

SPONTANEOUS pneumothorax is not a common condition, nor is it important statistically as a cause of morbidity or mortality. For example, in 1945 when the Navy and Marine Corps had a peak average strength of 3,673,855, the diagnosis of pneumothorax was made only 651 times (*1*). However, 65, or 10 percent, of these cases were readmissions; 83, over 12 percent, were invalided from the service; and 6 died.

As medical officers in the Armed Forces, we are in a position to observe far more than the usual number of patients presenting this syndrome since the age and sex incidence in this condition coincides precisely with that group of patients with whom we are most likely to come in contact, healthy young men.

There are two opinions concerning the pathogenesis of spontaneous pneumothorax. One is that of Macklin (*2*), who was able to demonstrate in animals that artificially induced elevation of intrabronchial pressure produced small but widespread rupture of the bases of the alveoli overlying the finer ramifications of the pulmonary vessels. This air gradually crowds into the sheaths of the larger blood vessels at the base of the lung and into the mediastinum, with the production of pneumomediastinum and, secondarily, through rupture of the visceral pleura, of pneumothorax.

The interrelationship of pneumomediastinum and pneumothorax has been demonstrated clinically, the most recent report being that of Dickie (*3*), who, in 20 university students, demonstrated pneumothorax alone in 6, pneumomediastinum alone in 7, and both conditions concurrently in the remaining 7.

The second view concerning pathogenesis is that of Ornstein and Lercher (*4*), who demonstrated fluoroscopically the sudden disproportionate overventilation of the lung apices when expiration was forced against the closed glottis (the Valsalva maneuver). They believe that apical overdistention, if repeated, could easily result in

[1] U. S. Naval Hospital, Philadelphia, Pa.

rupture of the elastic fibers of the subpleural alveoli, with eventual formation of an apical bleb. The ultimate rupture of this bleb, in their opinion, is the cause of certain cases of spontaneous pneumothorax. Draper (*5*), in his excellent review of this subject, considers Ornstein and Lercher's explanation the better of the two.

Spontaneous pneumothorax was recognized many years ago as occurring with significant frequency in patients with active pulmonary tuberculosis; abnormally friable tuberculous tissue breaks down, and a bronchopleural fistula follows. As a result of these observations it was assumed that spontaneous pneumothorax constituted prima facie evidence of pulmonary tuberculosis. This false assumption is still held in spite of an over-all incidence of tuberculosis of only 3 percent in all recently reported series of cases of spontaneous pneumothorax.

The immediate consequences of sudden pulmonary collapse are diminished lung volume, compression of pulmonary vessels and atelectasis, with diminished respiratory excursions due to pain and its splinting effect on the chest. This sudden reduction in vital capacity, and the simultaneous contact of a foreign substance with the highly sensitive parietal pleura, is a shocking event. Chest pain is invariably present and as a rule is poorly localized, except in those with associated pneumomediastinum, who show a high incidence of substernal discomfort. The pain is usually characterized as "stabbing" or "tearing," and is accentuated by respiration or movement of any kind. Dyspnea is common, and cyanosis is by no means rare if the patient is seen soon after onset of pneumothorax. Apprehension is always present and, in combination with the other manifestations, results in a most alarming picture to the physician who does not have a high index of suspicion of the possibility of pneumothorax.

The physical signs of pneumothorax, except in minimal collapse, consist of diminished excursion on the affected side, with hyperresonance and diminished to absent tactile and vocal fremitus. However, breath and voice sounds are at times remarkably well-transmitted, even in massive collapse. Demonstration of the coin sign is most infrequent.

Of particular interest is the phenomenon commonly associated with pneumomediastinum, in which there is a "crunching, crackling, clicking, bubbling or churning" noise, synchronized with the heartbeat, which is frequently audible to the patient (*5*). This is known as Hamman's sign, and is pathognomonic.

The immediate treatment consists in placing the patient in the most comfortable position, which usually is semi-upright. Reassurance is important, and this should be augmented promptly with an appropriate dose of morphine, which not only relieves pain and apprehen-

sion, but reduces the undesirable tendency to cough. Additional sedation is usually not required, since respiratory compensation occurs within a few hours, and pain gradually diminishes until the patient may complain only of a "heavy" or "tight" sensation on the affected side. Of utmost importance, however, is the continuous and careful observation of events immediately following collapse, bearing in mind the possible development of tension pneumothorax.

In the uncomplicated case, treatment from this point forward resolves itself into the Oslerian formula of "time in divided doses." Masterful inactivity on the part of the physician is indicated, with simple bed rest for the patient. The next day is soon enough for roentgenographic examination to determine the extent of collapse and search for possible parenchymal disease. Fluoroscopy is usually sufficient to follow the course of reexpansion, with occasional roentgenograms for confirmation of fluoroscopic findings or for record purposes.

Pulmonary tuberculosis having been ruled out, and with reexpansion progressing, the gradual resumption of activity is permitted, although some authorities advise bed rest for 2 to 4 weeks. Frequent warnings against the possible ill effects of strenuous activity are often necessary; the patient should be cautioned about the possibility of subsequent episodes of collapse. Full activity is resumed after an average of 3 to 4 weeks.

Of the complications, by far the most serious and potentially fatal is the development of tension pneumothorax in which the pleural tear permits entrance of air, but, through valvelike action, prevents its escape. The resultant increase in intrapleural pressure with concurrent progressive respiratory embarrassment calls for immediate action. When tension is suspected, the simplest diagnostic maneuver is the insertion of a medium-sized needle on a large (30 to 50 cc.) syringe into the pleural space. Prior to insertion the plunger is well-lubricated and withdrawn halfway, so that its movement after contact with the pleural space indicates immediately the condition within.

The management of tension pneumothorax is controversial, with Hennell and Steinberg (*6*) advocating a trial of placing the patient on the affected side. Most authors favor aspiration of air in sufficient amount to relieve respiratory embarrassment, using a pneumothorax apparatus in reverse and repeating the procedure as often as necessary. It should be emphasized that aspiration beyond the point of symptomatic relief is hazardous, in that it tends to widen the pleural tear.

The most widely applicable procedure for the control of tension pneumothorax in the absence of hospital facilities is the introduction

into the pleural space of a needle attached to several feet of rubber tubing, the distal end of which is immersed in several inches of water in an open container placed at least 18 inches below the needle. In this manner, excess air can escape by bubbling out, and the water trap acts as a valve in preventing the reentrance of air. The danger of tension is past when progressively longer periods of clamping the tube cause no discomfort, indicating closure of the pleural tear.

Another complication which, like tension pneumothorax, is fortunately uncommon is hemothorax. It is believed to result from stretching and subsequent tearing of an adhesive pleural band as the lung retracts with collapse. Withdrawal of blood and replacement with air is usually adequate to control bleeding, although intrapleural pneumonolysis has been reported necessary in some cases.

Hydrothorax is not uncommon, especially when reexpansion is slow. Diagnostic aspiration is always indicated when the amount of fluid is more than minimal; small effusions should occasion no alarm.

In an 18-month period at the U. S. Naval Hospital, Philadelphia, Pa., the diagnosis of spontaneous pneumothorax was established in 26 patients; 25 white men and 1 Negro. All were previously in good general health with the exception of one with advanced rheumatoid spondylitis and one with previously known active pulmonary tuberculosis. Their ages ranged from 18 to 41.

Six of the twenty-six had had a total of 12 previous episodes of collapse, the greatest number in any 1 patient being 4. Degrees of collapse varied from 15 to 100 percent, the majority exceeding 50 percent. The time required for reexpansion was quite variable, bearing no direct relationship to the degree of collapse. For example, 1 patient with 100 percent collapse required 13 days, while another with 20 percent required 21 days for complete reexpansion.

No evidence of pneumomediastinum was detected in this group. One had a small serous effusion, and one developed tension pneumothorax which required several aspirations prior to admission, by which time tension pneumothorax was no longer detectable. There was one instance of hemothorax, which required four aspirations, one of which resulted in the withdrawal of 1,600 cc. of blood, following which complete recovery occurred. Except in the one patient who was already known to be tuberculous, no evidence of active tuberculosis was detectable in the remaining 25.

The present series bears out the experience of others to the effect that spontaneous pneumothorax occurs predominantly while the patient is at rest. In 19 instances where the activity at onset is definitely known, the most violent exercise encountered was in one patient who first noted his symptoms immediately after leaping aboard

a bus. Of the remainder, 5 were standing, 3 were sitting, 3 were walking, 1 was bending, 4 were lying down, and 2 were asleep.

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Pediatric Excretory Pyelography

GLADEN R. HAMILTON, *Lieutenant Colonel, MC, U. S. A.*[1]
CHARLES A. DEKOVESSEY, *Captain, MC, U. S. A.*[1]

BECAUSE of the large amount of intestinal contents overlying the kidneys and ureters, adequate visualization of the renal collecting system by excretory pyelography in infants and small children is difficult. Matthei [2] has presented a method which re-

Figure 1.—Pyelogram taken with conventional technique showing obscuring of dye by overlying intestines.

[1] Brooke Army Hospital, Fort Sam Houston, Tex.
[2] MATTHEI, L. P.: Improved pediatric excretory pyelography. J. Urol. (In press.)

moves much of the difficulty previously encountered. The simplicity of his procedure is striking, and is the result of the adaptation of the incidental finding of excellent roentgenograms taken when the child had been inadvertently fed immediately prior to radiographic study. His method is essentially as follows: (*a*) Withhold fluids for 12 hours prior to pyelography. (*b*) Inject 10 cc. of contrast agent intravenously, even in small infants; the dose may be adjusted for older children, and the intramuscular route, though less satisfactory, may be used. (*c*) At the time of injection of dye, give the infant a full 8-ounce feeding; older children may be given two glasses of chocolate milk. (*d*) Between pictures, keep the infants in a nursery cradle with the foot elevated, constituting a modified Trendelenburg position.

The rationale of this procedure is based on the transverse position of the stomach in the infant or small child. When filled with liquid, there is a homogeneous relatively radiolucent large oval area overlying the normal position of the contrast agent through displacement of the intestines. Figure 1 shows a roentgenogram taken 25 minutes

Figure 2.—Pyelogram taken 5 minutes after injection of dye in patient whose liquid-filled stomach has displaced the intestines.

after the injection of the dye in a 20-week-old infant without feeding at the time of dye injection. The inadequate visualization of the renal collecting system is noted. Figure 2 shows the easy visualization of the renal collecting system with a liquid-filled stomach. We have used this method 4 months and the increased diagnostic value of excretory pyelograms in infants and small children in this period has been gratifying. In some roentgenograms, when the concentration of the dye was slight and when the films were unsuitable for photographic reproduction, the contrast has been entirely adequate for diagnostic interpretation. This method is recommended for general use.

Treatment of Intolerance to Quinacrine

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QUINACRINE in doses of 0.1 gram daily was well tolerated by most troops in malarial areas. A small percent of the personnel reported unpleasant symptoms, usually gastrointestinal, when suppressive therapy was started. When quinacrine was given in spite of these usually mild symptoms, tolerance was quickly established and suppressive doses could be maintained indefinitely without further difficulty. A much smaller number of men, after ingestion of quinacrine, had severe symptoms that became intensified rather than diminished with further doses. Attempts to continue administration of the drug to such men produced severely ill soldiers who often refused further medication even when threatened with court martial. These men were considered permanently intolerant to the drug and the use of suppressive doses of quinine was authorized for such personnel.

The opportunity to observe the reactions of hardened troops to quinacrine occurred when an infantry battalion, after 2 years of duty in nonmalarial areas of the Central Pacific, was ordered to the South Pacific and antimalarial therapy was started. The troops were given 0.1 gram of quinacrine daily and were informed that a small percent might have gastrointestinal symptoms for the first few days but that these would disappear after several doses of the drug. The tablets were swallowed under the supervision of an officer and a company aid man. The aid men reported that a moderate number of men complained of symptoms referable to quinacrine ingestion in the first week. Only a few of these men were seen in the battalion aid station, all with one or more of the following symptoms: nausea, vomiting, abdominal cramps, or diarrhea. These men were reassured and instructed to continue taking the drug. A few were given 1 or 2 doses of tincture of belladonna or paregoric to control their symptoms. After the first week there were no complaints, with the exception of the cases herein discussed.

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Two men reacted to quinacrine in a manner quite different from those previously mentioned and were considered to belong to the group for which transfer to quinine suppressive therapy was authorized. The criteria used to place these men in a separate category were (*a*) a reaction to quinacrine severe enough to render them totally unfit for duty and to require medical attention, and (*b*) an increase in the intensity of symptoms with successive doses of the drug—in contrast to the usual course of events. Both men were in good health and were responsible and stable members of the organization, having served with distinction through two campaigns. Psychic factors were not believed to be responsible for their atypical reactions. Because of the anticipated difficulty of maintaining and supervising proper quinine dosage in future combat situations, it was decided to attempt to overcome the intolerance of these two men to quinacrine. It seemed possible that adaptation might take place in these men, as in others, if the drug could be administered and *retained* for a reasonably long period. In order to make this possible, prophylactic treatment against the expected signs of intolerance was begun before starting administration of the drug. The object was to paralyze the mechanisms whereby intolerance was manifested, then to administer quinacrine, and maintain the inhibition of anticipated symptoms until it could be assumed that adaptation had taken place. This was accomplished in both cases and the method was later successfully applied to a naval officer.

CASE REPORTS

Case 1.—A 29-year-old supply sergeant started quinacrine medication while at a beachhead supply dump. On the first day, he noted abdominal discomfort. Nausea and diarrhea appeared the second day and on the third day the diarrhea became severe and he vomited. He then reported to a medical officer at the beach, who discontinued the quinacrine, waited several days for symptoms to subside, and then attempted desensitization with fractional doses of the drug, starting with one-quarter of a tablet. Symptoms of intolerance immediately reappeared, in an even more severe form. The diarrhea was incapacitating by the second day and was associated with vomiting. The attempt was abandoned on the third day when repeated vomiting prevented retention of the administered dose. The soldier was then given a supply of quinine, which he took daily without any signs of intolerance.

On moving up to the battalion area, this soldier reported to the aid station for a resupply of quinine. He was persuaded to undergo a final attempt at overcoming his intolerance to quinacrine. Four cubic centimeters of paregoric and 15 drops of tincture of belladonna were given 4 times daily for 2 days. On the morning of the third day he complained of constipation and dryness of the mouth. He was then given one-quarter tablet of quinacrine and, because of obvious apprehension, 0.1 gram of phenobarbital. He had one loose stool that morning and complained of some abdominal uneasiness. Belladonna and paregoric therapy were continued and two additional doses of 0.03 gram of phenobarbital were given that afternoon and evening. On the next day one-quarter

tablet of quinacrine was again given and the other medication was continued. He had no bowel movements or nausea that day and complained of drowsiness. On the fifth day, the dose of phenobarbital was reduced, only two doses of paregoric were given, and one-half tablet of quinacrine was administered. He had one soft stool. Sedation was discontinued on the sixth day but the other medication was maintained. On the sixth and seventh days, one-half tablet of quinacrine was given. On the eighth day, 5 days after starting the quinacrine, 1 tablet of quinacrine and 1 dose of belladonna and paregoric were given. Auxiliary medication was then discontinued and this soldier took 1 tablet of quinacrine daily without further evidence of intolerance.

Case 2.—A 38-year-old battalion commander started quinacrine medication when he returned to the organization after recovery from his combat wounds. Three to four hours after taking his first dose, he became nauseated, vomited several times, and complained of mild diarrhea and cramping abdominal pain. This reaction occurred at a regimental officers' party where he had consumed a large quantity of whisky, and the true cause of his symptoms was not realized. Two days later, he took another tablet of quinacrine and had a more severe attack of vomiting and diarrhea than on the first occasion. He then refused to take any more quinacrine.

Three weeks later he was persuaded to try to increase his tolerance to the drug. Four cubic centimeters of paregoric and 15 drops of tincture of belladonna were given every 4 hours, starting at noon. With the fourth dose at midnight, one-quarter tablet of quinacrine was given. At 0200 he had a watery stool and mild nausea. One-tenth gram of seconal was given at this time and the patient spent an uneventful night. On the second day, after similar preparation, he asked to be given one-half tablet of quinacrine at midnight, and took this larger dose with impunity. On the third day, his medication was changed to 1 motion sickness preventive (MSP) capsule every 4 hours because of favorable experience with this compound in treating nausea and vomiting unassociated with motion sickness. One-half tablet of quinacrine was again taken with impunity. On the fourth and fifth days, MSP capsules and 1 tablet of quinacrine were given. The patient's stools were normal and there were no untoward symptoms. On the sixth day, auxiliary medication was discontinued and daily doses of quinacrine were taken from then on without evidence of intolerance.

Case 3.—A naval medical officer on transport duty requested advice regarding one of the ship's officers who had severe nausea and moderate vomiting, without diarrhea, following the taking of quinacrine. Two attempts to administer the drug had been unsuccessful, in spite of the officer's wholehearted cooperation. The suggestion was made that MSP capsules be administered every 4 hours during the day and that quinacrine be given on the second day, with an initial dose of one-quarter tablet. This was done, and the dose of quinacrine was gradually increased on successive days. At the end of a week the officer was taking 0.1 gram of quinacrine daily without auxiliary medication and with no untoward symptoms.

DISCUSSION

The cause of intolerance to quinacrine is unknown. It does not appear to be an allergic phenomenon. In many cases a distinct psychic influence has been implicated. It is generally agreed that, with few exceptions, if a man can be persuaded to take the drug regularly for a short time, symptoms of intolerance will disappear. The experience reported here suggests that tolerance can also be developed in many of

these exceptions. Whether it would be possible to overcome all intolerance to the drug cannot be stated on the basis of such a limited experience. Although this series is small, it includes all of the cases meeting the criteria for the discontinuance of quinacrine administration seen, and there were no failures. The successful results reported here were not considered to be the effect of psychotherapy. In the absence of any clear understanding of the mechanisms of intolerance to quinacrine, it is only possible to speculate as to why the treatment described gave such satisfactory results. Two factors are thought to be responsible. First, it may be assumed that a relatively stable, gradually increasing, tissue concentration of the drug was eventually attained in the treated cases. Such a state must be much more conducive to the normal process of adaptation to the drug, than the widely fluctuating concentration curve that is probably to be found in the person who has violent gastrointestinal reactions soon after ingestion of quinacrine. Second, by inhibiting the symptoms of intolerance, the establishment of an intense conditioned response to the drug is avoided. The technique used in these cases should be generally applicable to similar problems with other therapeutic agents. Limited experience in a civilian general hospital suggests that this is the case.

The Early Diagnosis of Trachoma[1]

ADALBERT FUCHS, M.D.[2]

ALTHOUGH there are not many patients with trachoma in the United States, physicians in the Armed Forces may see such patients in the Pacific or in the Far East. Before World War I there were many patients with trachoma in Vienna, most of whom came from Hungary and Galicia. At one time there were so many patients with trachoma in the eye clinic, that my father, Ernst Fuchs, founded a special section consisting of an outpatient department and a 30-bed ward for them. In this section, special facilities for washing were provided to prevent the spread of infection by wash-basins and towels.

At that time much discussion about the diagnosis of trachoma resulted from the fact that many patients, especially school children, were seen with a slight conjunctivitis and a large number of follicles in the lower retrotarsal fold. These follicles resembled the nodules of trachoma. Schnabel maintained that those patients had trachoma, while my father and many others stated that these follicles were caused by follicular conjunctivitis and had nothing to do with trachoma, because with proper treatment these follicles promptly disappeared. The latter view came to be widely accepted.

Although persons with trachoma were not inducted into the Austrian Army before World War I, during the war they were accepted in special noncombatant trachoma battalions. After the war a part of Hungary with a German-speaking population was given as a Province to Austria. Thirty percent of the population in this territory were afflicted with trachoma. A campaign against trachoma was started and special care was given to school children. In 5 years trachoma was eliminated from this Province.

When I was in Peking in 1923, I saw a few patients with trachoma. The Chinese were using the same criteria in diagnosing trachoma that we had learned in Vienna. Very few of their cases were seen in the early stages, however. When I was again in China with the United

[1] Presented at Walter Reed Army Hospital, Washington, D. C., 20 March 1950.

[2] The New York Eye and Ear Infirmary.

Nations' Relief and Rehabilitation Administration and the World Health Organization in 1946 and 1947, I was surprised to find that great difficulty in diagnosis was being experienced. I was asked to examine the inmates of the Tsai Ho Ching Camp for destitute children. With 10 other trained ophthalmologists we examined more than 1,000 children, and found that many of the children between 6 and 14 years of age had a transparent conjunctiva and numerous yellow, steeply elevated nodules in the upper tarsus. The lower retrotarsal fold showed little change and there was no hypertrophy of the conjunctiva. These were certainly not the typical findings seen in trachoma. Many of the Chinese oculists, however, diagnosed these cases as trachoma. The opinion and diagnosis of the Chinese physicians varied a great deal (table 1). It was surprising that the military survey shown in the table revealed more trachoma than the survey of refugees. In the Tsai Ho Ching Camp, I found trachoma in 65 percent while the 10 other observers found it in 92.5 to 100 percent. In patients with trachoma in the first stage the diagnosis was doubtful in 14 of my cases, so the true percent of trachoma was probably less than 65. It was also surprising that C. H. Chow found trachoma in only 33.5 percent of the patients in the outpatient department of the Peking University Medical College. The figures of E. Chang and H. H. Chi were likewise unusual since only patients with ocular disease were included in their study and a higher percent with trachoma would be expected. The Rotary Club in Lanchow, like several others in China, sponsors an outpatient department for patients with trachoma. For several weeks I examined all the patients in this department and found that only 82 percent actually had trachoma.

TABLE 1.—*Percent of patients diagnosed trachoma in China*

Observer	Source of patients	Number examined	Trachoma (percent)
C. H. Chow	Refugees	22,771	[1] 41.4
C. H. Chow	Outpatient department, Peking University Medical College.	4,150	33.5
Group of ophthalmologists	School children	234,503	[2] 48.46
T. Y. Miao	Primary school children (Chengtu, 1941–44).	4,903	20
Chinese Army Medical Corps	Chinese Army, guards of the I Corps	442	70– 75
Group of 11 ophthalmologists	Reform Camp Tsai Ho Ching	1,045	65–100
Eugene Chang	Inpatients, West China University (1938–39).	1,025	32.2
H. H. Chi	Inpatients, West China University (1940–43).	2,903	45
A. Fuchs	Trachoma section of outpatient department, Lanchow.		82

[1] 20 percent considered doubtful not included in this figure.
[2] This is an average. The range was 42 to 62 percent.

These discrepancies can only be explained on the basis of the diagnosis of common chronic conjunctivitis as trachoma. Furthermore,

two conditions are seen in China that are similar to trachoma: (*a*) yellow nodules in the transparent tarsal conjunctiva without special involvement of the upper and lower retrotarsal fold, and (*b*) severe chronic conjunctivitis caused by constant wind and dust leading to papillary hypertrophy of the conjunctiva. To diagnose these doubtful types of conjunctival change, smears of conjunctival epithelium were stained with Giemsa stain; if inclusion bodies were seen, trachoma was present. Another way to make a diagnosis was to give an adequate course of treatment in doubtful cases; if the conjunctival manifestations disappeared in from 4 to 6 weeks there was no trachoma. In former years, a treatment of at least 2 years was necessary to cure true trachoma. Today, 5 to 6 months usually suffices. At a meeting of the Bureau of Public Health in Nanking, 10 experienced Chinese ophthalmologists maintained that trachoma could usually be healed in 6 weeks. This statement only proves that most of the cases were not true trachoma. That true trachoma takes just as long a time for healing in China as elsewhere was shown by the fact that a Chinese ophthalmologist with trachoma still had active manifestations of the disease after 2 years of energetic treatment.

Although Duke-Elder[3] states that trachoma usually starts imperceptibly and subacutely, and this has been my experience, many ophthalmologists still believe that trachoma starts as a severe acute inflammation. It is true that in the beginning there is often a mixed infection. This is observed especially in Egypt where so many other types of severe infectious conjunctivitis are seen. In these cases, the virus of trachoma is transmitted with the conjunctival secretion. In Egypt the flies that often literally cover the eyes of children apparently transmit the disease.[4] In a country where there is much trachoma special attention must be paid to patients with severe conjunctivitis. Duke-Elder emphasizes the following characteristics of acute trachoma: (*a*) severe secretion and irritation; (*b*) a velvety papillary condition of the palpebral conjunctiva; (*c*) thin gray lines or points and sometimes larger foci in the superficial corneal layer; and (*d*) swelling and tenderness of the preauricular gland. The last finding is not present in chronic trachoma.

It is difficult to recognize trachoma in the early stage when there are no signs of irritation. I shall not discuss signs that can be seen only with the slit lamp. They are of scientific interest but for the examination of large numbers of patients we cannot rely on them.

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[3] DUKE-ELDER, W. S.: Text-book of Ophthalmology, Vol. II. C. V. Mosby Co., St. Louis, Mo., 1937 (reprinted 1946). p. 1611.

[4] FUCHS, A.: Suggestions for prevention of blindness. Am. J. Ophth. 17: 232–237, Mar. 1934.

Wilson[5] emphasized that in the earliest stage "small yellowish grey avascular areas (follicles)" may be "scattered over the tarsal conjunctiva. All the normal conjunctival vessels are obscured by new vessel formation and infiltration of the lamina propria." He advised that the slit lamp be used to see "signs of corneal involvement as manifested either by infiltration or new vessel formation." Wilson considers as significant and suggestive, and as one of the first signs, "the narrow band of raised limbal edema which skirts the upper half of the cornea and tails away in the lower half although it sometimes extends right around the cornea." I do not consider this swelling of the limbus an essential sign in the differential diagnosis, because it is seen in other types of acute or subacute conjunctivitis and in early interstitial keratitis. Because examination of a large number of people with the slit lamp is not possible, it is simpler to make epithelial smears. In nearly 100 percent of smears, inclusion bodies can be found if trachoma is present.

In fully developed trachoma the follicles of the tarsal conjunctiva are less readily visible, the nodules in the retrotarsal fold are more conspicuous, and the opacity of the conjunctiva of the upper lid is more distinct. Ishihara[6] states that trachoma usually starts as an acute or subacute conjunctivitis. Because this is chiefly a disease of children the inflammation may at first be mistakenly considered catarrh of the conjunctiva and may be neglected. Later trachoma develops insidiously. This opinion combines the acute or subacute onset with an insidious development and coincides with my experience. Ishihara inoculated 31 normal conjunctivas of blind people with trachoma. The disease was transmitted to all but 5 subjects who were inoculated with material taken not from the conjunctiva but from the lacrimal sac. The incubation period was 3 to 9 days. The inflammation that followed inoculation was mild in 8, of medium degree in 9, and severe in 9 subjects. On the second to seventh days of the disease in these subjects the papillary hypertrophy affected the whole conjunctiva of the lower lid. On the seventh to fourteenth days the conjunctiva of the entire upper lid showed papillary proliferation. On the second to twelfth days tiny nodules appeared on the upper and lower retrotarsal fold. On the fourteenth to twenty-first days these became real nodules as the opacity and swelling of the conjunctiva increased. On the tenth to twenty-eighth days yellow-white pointed, flat, and small nodular infiltrations appeared in the conjunctiva of the lid. The vessels

[5] WILSON, R. P.: Presidential address: Some conjunctival affections. Tr. Ophth. Soc. New Zealand. New Zealand Medical Journal (supplement), pp. 4–27, 1948.

[6] ISHIHARA, S.: Etiologie des Trachoms. Japanische Ges. zur Förderung der wissenschaftlichen Forschungen, Tokyo, 1941.

in the conjunctiva of the lower lid became invisible on the first to third days. In the upper palpebral conjunctiva they disappeared on the twelfth to fortieth days. In mild cases they were visible during the entire course of the disease. In most of the patients a fine diffuse keratitis was noted and corneal infiltrations were seen in 5. These observations showed that inoculated trachoma represents a much more severe infection than trachoma transmitted in the usual way.

Mitsui [7] presented an account of 105 experimental inoculations of trachoma in blind subjects in whom trachoma started acutely without exception within 3 to 9 days. In 21 subjects the trachoma went spontaneously to the second eye. A cure was the exception even after several months of treatment. Conjunctival scars may form in some cases 10 to 20 years after the onset of the disease. In 392 patients with typical signs of trachoma, Mitsui found inclusion bodies in 85 percent. The finding of inclusion bodies decreases with chronicity.

Four stages (MacCallan) are differentiated:

1. Early stage of infiltration characterized by an absence of the typical signs.

2. Period in which trachomatous changes (typical nodules, papillary hypertrophy, and pannus) become definitely recognizable. This stage may last for several years.

3. Stage of scarring.

4. Stage in which signs of active inflammation have vanished and the sequelae (trichiasis, entropion, and xerosis) remain.

According to the Viennese ophthalmologic school, the three cardinal signs of the second stage are: papillary hypertrophy, nodules, and pannus. Beginning pannus may be barely distinguishable in the first stage. Usually papillary hypertrophy and the nodules in the retrotarsal fold are the only signs observed in early trachoma. I should like to describe the three cardinal signs of the second stage in more detail. In hypertrophy of the superior and inferior tarsal conjunctiva the conjunctival vessels are *not* visible because they are blurred by the infiltration of the conjunctiva. Hypertrophy of the tarsal conjunctiva is found not only in trachoma but also in other chronic severe conjunctival inflammations such as atropine-catarrh, long-lasting phlyctenular conjunctivitis, and senile conjunctivitis. These cases are easy to differentiate from trachoma by their special symptoms and by the fact that the characteristic nodules are not present. The hypertrophy in such cases responds to treatment in a short time. Although hypertrophy of the tarsal conjunctiva is not pathognomonic of trachoma it is indispensable for the diagnosis.

[7] MITSUI, Y.: Etiology of trachoma. Am. J. Ophth. 32: 1189–1196, Sept. 1949.

Nodules are frequently found in follicular conjunctivitis but in trachoma they are found chiefly in the upper and lower retrotarsal fold and often in the semilunar fold. In the early stage of trachoma small nodules may also be present in the tarsal conjunctiva. The connection between the conjunctiva and the tarsus in normal lids is especially tight and does not permit the formation of the nodules in the earliest stages of trachoma. Furthermore the papillary hypertrophy hides the accumulation of the lymphocytes forming the nodules. Later when the subconjunctiva is filled by cells and therefore loosened, nodules in the tarsus are more frequent, but apparently never the rule. They become grayer and less yellow. The typical nodules of trachoma are roller-shaped, oblong, and opaque. They are situated in a red conjunctiva that is *not* transparent. The nodules in the follicular catarrh (most common in children) project higher, are steep, and usually smaller than the nodules in trachoma. These nodules are transparent and situated in the retrotarsal fold, often packed together in the inner lid angle, in the semilunar fold, and surrounding the caruncle. Sometimes the entire superior tarsus is covered with such small elevated follicles. The characteristic diagnostic sign of follicular catarrh is the presence of small follicles lying in a pale and transparent conjunctiva the vessels of which can be differentiated. In fully developed trachoma (stage II) the typical nodules are present in the retrotarsal fold and the nodules in the tarsal conjunctiva are much less common.

Pannus is not a pathognomonic finding but an exceedingly important one. The mere presence of a hyperemic marginal network of conjunctival vessels is not to be considered a beginning pannus. Pannus is present only when fine vessels have grown from the limbus into the transparent cornea. This can sometimes only be determined with a loupe or slit lamp. Pannus is often mistakenly reported. Pannus trachomatosus lies beneath Bowman's membrane and is composed of vessels and a layer of lymphocytes. It usually starts above and the vessels run from above straight downward. Other diseases may produce pannus. In children, pannus in phlyctenular conjunctivitis is common. It may start from all sides, not only from above. This condition can be differentiated from trachoma by the presence of typical phlyctenulas or corneal infiltrations and the absence of tarsal hypertrophy and nodules. Pannus can also be caused by eczema of the face, mycosis barbae, leprosy, and, commonly, acne rosacea. These diseases are characterized by other signs that facilitate the diagnosis.

SUMMARY

Early trachoma is diagnosed by the typical nodules in the retrotarsal fold and the hypertrophy of the tarsal conjunctiva which ob-

scures the tarsal vessels. Later in the course of the disease the conjunctiva of the retrotarsal fold becomes opaque obscuring the conjunctival vessels. If in such cases a beginning or fully developed pannus is seen there can be no doubt about the diagnosis. The diagnosis can be ascertained by a smear of the conjunctival epithelium. Inclusion bodies can nearly always be found in early cases. The inclusion bodies appear blue when stained with Giemsa stain and they are usually situated as a mass occurring next to the nucleus and shaped like a calotte. One may find reddish stained elementary bodies and basophilic initial bodies. The latter type of body looks like an oblong signet on a ring. The mass of the inclusion is formed by the bluish rest body.

At the end of the second and beginning third stage of trachoma, scars appear, especially in the upper tarsus. In Europe, they usually follow the sulcus subtarsalis, are parallel with the free margin of the lid, and form whitish lines. This position is pathognomonic. These scars remain for decades and reveal the former existence of trachoma. These scars are so located because here the vessels and nerves perforate the tarsus, connecting the conjunctiva with the tissue in front of the tarsus. Thus the tissue in front of the tarsus may be infiltrated, causing the lid to become heavy and, together with the infiltration of Mueller's muscle, the characteristic ptosis develops. In China, trachoma is much less severe than in Europe or the Near East. The horizontal scars so common in Europe are rarely seen in China where a more common finding is a flame-shaped scar extending from the retrotarsal fold into the conjunctiva of the upper parts of the tarsus. In China the flame-shaped scars may be combined with the scars in sulcus subtarsalis or the latter may occur alone.

It will have to be decided some day whether children with nodules in a normal tarsal conjunctiva have true trachoma, which I doubt very much. Bacteriologic examination and the treatment of a number of these children for some time should help to solve this problem. A therapeutic test is essential because these children might harbor inclusion bodies and so be carriers without having clinical trachoma. The carrier state in trachoma has not been proved, but carriers of other viruses exist so it is a possibility. If treatment causes these follicles to disappear in from 4 to 6 weeks, true trachoma was not present.

Meningococcemia

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MILD epidemics of meningococcemia without meningitis occurred in World War I [2] and World War II.[3–11] Although at other times this disease usually dropped in incidence it should be kept in mind in the differential diagnosis of bizarre febrile conditions. The reported epidemics were associated with the close contact of troops—particularly young men from rural areas—and the exposure and fatigue incident to training.

CASE REPORT

A 20-year-old man was admitted to this hospital on 17 July 1949 complaining of multiple joint pains involving the right shoulder, right knee, left ankle, left wrist, and interphalangeal joints. These pains had been present for a few days and were associated with anorexia, malaise, and elevations of temperature to 101.5° F.; there had been no chills. Five days prior to admission when complaining of a sore throat, he was told that he had a "pus bag" on his tonsils. There was a vague history of "rheumatism" when he was between the ages of 11 and 13 years, but no chorea, epistaxis, vomiting, or heart murmurs

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[1] Tripler Army Hospital, Honolulu, T. H.

[2] HERRICK, W. W.: Early diagnosis and intravenous serum treatment of epidemic cerebrospinal meningitis. J. A. M. A. 71: 612–617, Aug. 24, 1918; id. Tr. Sect. Practice M., A. M. A., 1918, p. 52.

[3] HERRICK, W. W.: Extrameningeal meningococcus infections. Arch. Int. Med. 23: 409–418, Apr. 1919.

[4] HERRICK, W. W.: Meningococcus arthritis. Am. J. M. Sc. 158: 473–480, Oct. 1919.

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[7] SCHWARTZ, B. M.; THORNTON, J. T., JR.; and LUNDY, C. J.: Acute meningococcemia. Mil. Surgeon 94: 105–111, Feb. 1944.

[8] SWEET, L. K.; DOWLING, H. F.; and HOWELL, M. J.: Acute meningococcemia. J. Pediat. 30: 438–445, Apr. 1947.

[9] DENNY, E. R.; BAUSCH, R. G.; and TURNER, M. A.: Meningococcal infection; meningococcal meningitis and septicemia. Am. J. M. Sc. 208: 478–490, Oct. 1944.

[10] DANIELS, W. B.; SOLOMON, S.; and JAQUETTE, W. A., JR.: Meningococcic infection in soldiers. J. A. M. A. 123: 1–9, Sept. 4, 1943.

[11] HILL, L. W., and LEVER, H. S.: Meningococcic infection in Army camp. J. A. M. A. 123: 9–13, Sept. 4, 1943.

were reported. He had had repeated sore throat and enlarged tonsils for many years and had been advised to have a tonsillectomy.

On admission the temperature was 99° F.; the pulse, 92; and the respirations were 20. The face and anterior portion of the neck were flushed. A discrete maculopapular rash was noted on the thorax and extremities; including the palmar and plantar surfaces, with lesions measuring 0.5 to 1.5 cm. in diameter. There was conjunctival injection; no petechiae were seen; and the fundi were normal. The nasal passages were moderately congested and the tonsils were moderately hypertrophied and injected, but no membrane or exudate was seen. There was no cervical lymphadenopathy or rigidity. A soft, blowing, Grade I systolic murmur was heard just medial to the apex. The spleen was not palpable. The left hand, the right knee, and left ankle were diffusely swollen without evidence of effusion. The neurologic examination was normal. In the first week after admission, the temperature varied between 99° and 102° F. There was a moderate tachycardia and the patient complained of malaise although he appeared to feel better than the objective findings warranted. A purpuric and petechial rash associated with an indurated macular area 3 cm. in diameter was noted about the ankles. Similar lesions were noted at the distal interphalangeal joint of the left third finger and at the base of the right thumb. These lesions were associated with swelling and moderate discomfort. No painful areas were ever found at the tips of the fingers or toes, nor were any typical petechiae seen on repeated examination of the conjunctivae, buccal mucosa, nail beds, or elsewhere.

The erythrocyte count on admission was 4.8 million with 14 gm. of hemoglobin. The leukocyte count was 34,600 with 87 percent neutrophils and 13 percent lymphocytes. Two days after admission the leukocyte count was 25,000; on the fifth day, it was 29,000 with 73 percent neutrophils; and on the eighth day it was 35,000. The sedimentation rate was 40 (Wintrobe). Agglutinations for *Salmonella typhosa*, *Brucellae* and heterophil antibodies were negative. The Weil-Felix reaction with OXK antigen was positive in a titer of 1 : 160. Repeated blood cultures were taken on thioglycollate media. Three were positive for *Neisseria intracellularis*. Aspiration of the skin lesions failed to reveal any organisms. Cerebrospinal fluid studies revealed a normal pressure, clear fluid, and 3 leukocytes per cu. mm. An EKG revealed a sinus tachycardia, right axis deviation, and a PR interval of 0.16 sec.

Specific therapy and antibiotic drugs were withheld until a definite diagnosis could be established; then starting with an initial dose of 2 grams of sulfadiazine, the patient was given 1 gram of sulfadiazine every 4 hours and 50,000 units of penicillin every 3 hours. The temperature returned to normal by the following morning and remained so. No new skin lesions appeared. The rash slowly faded and disappeared. The leukocyte count and sedimentation rate returned to normal. Several blood cultures were negative and a second Weil-Felix reaction was negative. Penicillin and sulfadiazine were discontinued after 12 days of normal temperature, the patient having received 4,800,000 units of penicillin and 62 grams of sulfadiazine.

DISCUSSION

Herrick[2,3,4] believed that meningococcus infection occurred in three stages: (*a*) primary localization in the nasopharynx of patients, normal persons, and carriers; (*b*) invasion of the blood stream by the

more virulent organisms, sometimes lasting for weeks, months, or even years; and (*c*) involvement of the various systems. Hematogenous metastases to the meninges accounts for the more familiar meningococcic meningitis. Implantation may occur in the synovia causing arthralgia. Involvement of the capillaries and other skin structures produce various types of rash.[12] The concept of hematogenous spread as opposed to the alternative of direct extension along the nerve roots is now commonly accepted.[13] Hematogenous spread can be explained by a phagocytosis of the meningococci in the nasopharynx and then a breakdown of the phagocytes by the virulent meningococcic toxin liberating the organisms into the blood stream.[14]

In an epidemic outbreak 60 to 70 percent of the local population become carriers.[9] Although the proportion of carriers in a population, usually 2 to 10 percent between epidemics, may rise to 80 percent during an epidemic.[10] Bernhard and Jordan [15] reported that less than 25 percent of the cultures from the nasopharynges of 3,846 contacts were positive. Despite the fact that the disease, which is not highly contagious, occurs in epidemics, no remarkable incidence of cross infection has been demonstrated. Some as yet unknown factor probably causes the change from a carrier state to a diseased state. Broders and Snell [16] reported that as high as 35 percent of patients do not show meningeal involvement at the time of the initial diagnosis.

A typical patient with meningococcemia presents the findings of an acute febrile disease of abrupt onset associated with widespread skin lesions of various types with accompanying vague joint and muscle pains and often gives a history of antecedent upper respiratory infection. The fever is usually remittent, but not high. It may be quotidian, tertian, or even quartan and of short or long duration. The most significant clinical findings are the skin lesions that may be maculopapular, petechial, hemorrhagic, purpuric, or even necrotic in localized areas. They may resemble the lesions of erythema nodosum. The minimal petechial lesions centered in maculopapules have been likened to insect bites. A careful and repeated search should be made for the skin lesions as they may be few and evanescent. New

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crops of skin lesions often appear with the rise in temperature.[17] Strong [13] reported that 82 percent of 92 patients had a petechial rash. Of these, 5 had a macular rash prior to the petechiae. The maculopapular rash is considered prodromal by some observers. Hill and Kinney [18] described vesicles and pustules following the earlier macules and papules. They noted a predilection of the regions of the small joints of the hands and feet. Concomitant maculopapular and purpuric lesions are often present.[5]

Various arthralgias and myalgias are prominent but less constant findings and are often associated with swelling and sometimes effusion into the joints. No particular joints are involved classically, but the smaller peripheral joints are most frequently affected. Arthritic involvement occurs as: (*a*) multiple early transitory arthralgia, probably on the basis of synovial hemorrhages; (*b*) more prolonged monoarticular involvement, often of the knee, and frequently purulent; and (*c*) arthralgia incident to serum therapy [2 3 4].

There may be minimal or no evidence of meningeal involvement. Negative Kernig and Brudzinski tests are the rule. Splenomegaly may be present. Endocarditis has been suspected in a number of cases.

Hill and Kinney [18] reported 25 necropsies and described the microscopic findings as a diffuse vascular damage with dilatation of blood vessels, swelling of endothelial cells, diapedesis, and perivascular hemorrhages. Meningococci were demonstrable in the endothelial cells and in the polymorphonuclear leukocytes. They also described the presence of thrombi in the blood vessels. Similar petechial and hemorrhagic lesions were found in serosal, epicardial and endocardial layers as well as in the lungs, liver, kidneys, adrenals, and spleen. The platelet count diminished in two of their patients with purpura, and was normal in two without purpura. It is their belief that the platelet involvement in the thrombi and the resultant thrombocytopenia might add to the increased hemorrhagic tendency.

The diagnosis of meningococcemia is confirmed by recovering the organism from the blood. In meningococcic meningitis, the organism is found in the blood as well as in the cerebrospinal fluid. Hoyne and Brown [19] recovered meningococci from the skin lesions in 70 percent of the patients they examined. Bernhard and Jordan [15] detected meningococci from purpuric lesions in 27 of 40 patients by direct smear. The cultures were positive in 35 of this series.

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The leukocytosis in meningococcic infection is higher than in many other septic infections and is associated with a shift to the left in the Schilling count. Leukocyte counts of 25,000 to 35,000 are frequent. Craster and Simon [20] reported a patient whose count was 60,000 with 90 percent neutrophils. They also noted that meningococci occasionally can be seen in the leukocytes in the peripheral blood smear.

Prior to the advent of various chemotherapeutic and antibiotic agents, the treatment of meningococcemia was rarely effective. The sulfonamides and penicillin have so reduced the mortality rate that serum therapy has become obsolete. Recent studies have demonstrated the effectiveness of aureomycin in the treatment of this disease [21].

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Mesenteric Cyst

Report of a Case

ROBERT B. STROTHER, *Commander (MC) U. S. N.*[1]

CYST of the mesentery is a rare pathologic condition of surgical importance. It has a reported incidence of 1 per 100,000 hospital admissions (*1*). The great difficulty in making a preoperative diagnosis and the problems presented in the surgical treatment make it a subject of great interest.

There is a great difference of opinion in regard to the classification of mesenteric cysts, probably because their origin is obscure: many types have been described. According to Warfield (*2*) they originate from retroperitoneal organs, namely the germinal epithelium, ovary, wolffian or müllerian bodies. Remnants of these tissues are thought to be displaced between the leaves of the mesentery where they take up an independent and aberrant existence. A logical theory is that of displaced embryonal intestinal tissue. Other theories involve dermal inclusions, as suggested by Bartlett in 1923; angiomas; pseudocysts of bacterial, infectious, or of malignant sources; and lymphatic obstruction.

Many cysts remain so small as to be symptomless. However, symptoms may occur as the result of mass, traction, compression, or torsion with the resulting compromise of the intestinal lumen or of the blood supply. Chronic or acute intestinal obstruction was present in over 50 percent of the recorded cases (*3*).

Pathologically the two most commonly encountered mesenteric cysts are the enteric and those consisting of dilated lymphatic channels; the size varies greatly. Enteric cysts are usually unilocular and contain mucoid material. Histologically the wall of the cysts may duplicate that of the intestine. However, as the cyst becomes larger there may be a fibrous replacement of the mucosa and later of the muscle layer.

A correct preoperative diagnosis of the uncomplicated case is difficult and in the presence of the most common complication, intestinal obstruction, an accurate diagnosis is nearly impossible.

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Treatment is almost invariably surgical; the exact procedure will be determined by the operative findings and by the general condition of the patient. The most frequent complications are intestinal obstruction, peritonitis, hemorrhage into the cyst, rupture into the bowel, torsion of the cyst, torsion of the cyst with gangrene, and impaction of the cyst within the pelvis. The usual surgical procedures are enucleation, marsupialization, drainage, and resection of the cyst and often of the adjacent bowel.

CASE REPORT

An 18-year-old man was admitted with a complaint of pain in the right lower abdomen. The patient stated that he was well until 8 hours before admission when a continuous dull-aching, para-umbilical pain occurred. This pain gradually became more severe and 3 hours before admission shifted to the right lower quadrant of the abdomen; by this time the pain was a continuous dull ache with acute exacerbations every 10 to 15 minutes. The patient was nauseated from the onset of the pain.

Past history.—He had the usual childhood diseases and during the year preceding admission he had had two or three attacks of mild abdominal cramping pain which had lasted less than 1 hour.

Physical examination.—The patient lay quietly on the examining table with his thighs flexed and seemed to be in moderate pain. His temperature was 98.4° F.; pulse, 84; respirations, 20; and blood pressure, 130/84. His general examination was normal except for the abdomen which, on inspection, appeared to be normal; on palpation there was considerable tenderness over McBurney's area; right rectus muscle spasm was evident. The entire left abdomen was soft but there was definite rebound tenderness referred to the right lower abdominal quadrant. There was no evidence of excessive free peritoneal fluid; bowel sounds were normal on auscultation.

Laboratory examination.—The leukocyte count was 8,000 shortly prior to admission; on admission the white blood cell count was 10,100/cu. mm. with a differential count of 62 neutrophils, 37 lymphocytes, and 1 eosinophil. Red blood cell count was 5,100,000; hemoglobin 15 gm./100 cc. Bleeding time, clotting time, and urinalysis were within normal limits. A preoperative diagnosis of acute appendicitis was made.

Operative report.—The abdomen was opened through a muscle-splitting McBurney incision. On opening the peritoneum an excess of free peritoneal fluid was noted. The appendix and adjacent large and small bowel appeared to be normal. Projecting anteriorly between loops of small bowel in the right lower abdomen was a hemorrhagic-appearing pedunculated cyst about 3 cm. in diameter. This cyst was freely movable but was attached posteriorly by a narrow pedicle, about 2 cm. in length, to the inferior aspect of the dorsal root of the mesentery of the small bowel. Further examination indicated that the appearance of the cyst was due to hemorrhage into the wall of the cyst, into the cyst cavity, or both. The cyst was removed surgically. A normal-appearing appendix was removed and the abdomen closed. Postoperatively, the patient made an uneventful recovery.

Pathologic report.—The speciman is a hemorrhagic-appearing encapsulated and pedunculated cystic mass measuring 2×3×1.4 cm. The cyst on opening contained mucin.

Histologic examination: Sections of the cyst show a central cavity lined by small epithelial cells in two layers. There is a basal layer of small cuboidal cells and an inner layer, which is incomplete, of low columnar ciliated epithelial cells. Outside the epithelial layer there are concentric layers of smooth muscle and among the muscle bundles are a few glandular lobules composed of small acini lined by cuboidal epithelial cells; some of these cells contain a mucous vacuole in the cytoplasm. Outside the muscle layer is peritoneum and vascular adipose tissue. All of these tissues are extensively infiltrated by extravasated red blood cells and scattered polymorphonuclear leukocytes. This hemorrhage is apparently fresh.

Pathologic diagnosis.—Enteric cyst of the mesentery with torsion and venous infarction.

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A Portable X-Ray View Box

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JENNINGS C. KOODA, *Captain, MC, A. U. S.*[1]

THE need for a portable x-ray view box has long been noted on the ward rounds of a large orthopedic service. Such a device was recently constructed in the brace shop from standard medical supply items and salvage materials, and has proved highly satisfactory (figs. 1 and 2).

Figure 1.—(B) *Batteries;* (C) *charges;* (D) *cord for charging.*

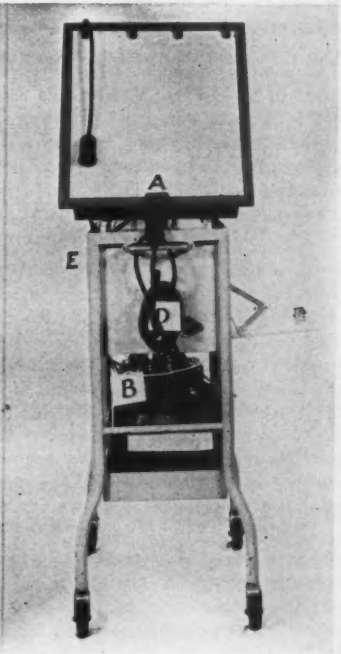

Figure 2.—(A) *View box;* (B) *batteries;* (D) *cord for charging;* (E) *cabinet.*

[1] Percy Jones General Hospital, Battle Creek, Mich.

The cabinet was taken from an old anesthesia suction machine from which the motor and pump had been removed. A regular x-ray view box with two 108-watt 6-volt incandescent bulbs was mounted on the cabinet. The electric power was derived from two 6-volt storage batteries that were connected in parallel and were mounted on the lower shelf of the cabinet. With fully charged batteries, the illumination of the roentgenograms appeared to be better than in a regular view box and continued to be sufficient for the duration of ward rounds frequently lasting 2 or 3 hours. A conveniently located switch was used to turn off the lights to conserve the power when the view box was not in use. To overcome the inconvenience of returning the batteries to the maintenance shop for recharging, a battery charger was mounted in the upper shelf of the cabinet. In this way, recharging could be accomplished by connecting the batteries to a wall receptacle of the 110-volt hospital circuit on the ward, and the view box was ready for immediate use at any time. This view box can be easily constructed in any Armed Forces general hospital and will facilitate the interpretation of roentgenograms.

Acute Ruptured Appendicitis and Peritonitis With Urinary Symptoms

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ACUTE appendicitis masquerading as a genito-urinary disorder is an easily recognized syndrome. However, the converse of this is of importance in the differential diagnosis of acute appendicitis. The necessity of being aware of the protean manifestations of appendicitis was well illustrated in the complicated case reported here.

CASE REPORT

A 20-year-old sailor was admitted to this hospital complaining of urinary urgency, dysuria, and abdominal pain. He had been perfectly well until the afternoon preceding admission, when after lunch, he felt ill and went to bed. He awoke 4 hours later with extreme urinary urgency. Micturition afforded no relief and he began to have a steady pain in the hypogastrium. He became nauseated and vomited but slept fairly well that night. The next morning he again had a dull, unremitting pain in the hypogastrium associated with anorexia, nausea, and vomiting. Dysuria was first noted at this time.

Physical examination revealed an obviously ill young man with a malar flush. His temperature was 101° F.; pulse, 95; and respiration, 25. The abdomen was somewhat distended, tympanitic, and peristaltic sounds could not be heard on auscultation. There was extreme tenderness and spasm in the right lower abdominal quadrant and rebound tenderness in the same area. The psoas muscle sign was negative and there was no testicular pain or retraction. No tenderness could be elicited by palpating the right costovertebral angle. The leukocyte count was 18,250 with 87 percent neutrophils, 11 percent lymphocytes, and 2 percent monocytes. The blood chlorides were 360 mg. per 100 cc. The urinary sediment contained 8 to 10 pus cells per high-power field and an occasional red blood cell. A roentgenogram of the abdomen revealed several loops of dilated small intestine but no evidence of calculi.

A diagnosis of acute peritonitis probably secondary to a ruptured appendix was made. Concomitant genito-urinary disease could not be definitely diagnosed. Before operation, the patient was given intravenous fluids and Wangensteen suction was begun. At operation a foul-smelling purulent fluid was found in the peritoneal cavity; culture of this fluid revealed *Escherichia coli*. The appendix was adherent in the midline to the apex of the bladder. Several loops of ileum were also agglutinated to the mass. The adhesions were carefully cleared and

[1] 7th Station Hospital, Trieste.

the appendix found to be perforated just proximal to the tip. The bladder was edematous and pericystitis was present. The appendix was removed and 1 gram of streptomycin and 1,000,000 units of penicillin were placed in the peritoneal cavity. The incision was closed without drainage.

Postoperatively, intravenous fluids and Wangensteen suction were continued for 4 days. Convalescence was complete in 7 days and was uneventful except for the occurrence of a superficial wound infection. Streptomycin, 0.25 gram every 6 hours for 5 days, was given intramuscularly. Penicillin, 100,000 units every 6 hours for 10 days, was also administered.

DISCUSSION

The urologic manifestations of acute appendicitis include (*a*) disorders of micturition, (*b*) tenderness in the right costovertebral angle, (*c*) pain and retraction of the testes, and (*d*) abnormalities of the urine.

Disorders of micturition.—Urinary frequency and dysuria are the most frequent urinary complaints (*1*). These can be attributed to direct irritation of the renal pelvis, ureter, or bladder by the inflamed appendix. Because the appendix has at least six normal positions in the abdomen, namely, retrocolic, splenic, promontoric, pelvic, midinguinal, and paracolic reaching the right kidney, any portion of the genito-urinary tract can be affected (*2*). The most frequently involved site of irritation appears to be the right ureter at the brim of the bony pelvis. Urinary retention is caused by an irritation of the bladder sphincter, but this is an uncommon symptom (*3*).

Tenderness in the costovertebral angle.—Cope (*4*) found this to be a common symptom in appendicitis and maintained that it did not always signify a retrocecal appendix, since the pain could be elicited in patients in whom operation revealed the appendix not lying on the quadratus lumborum muscle. He believed such pain to be caused by hyperesthesia of the posterior area supplied by the tenth thoracic nerve, the segment that also supplies the appendix. When a perforated appendix lies on the quadratus lumborum muscle, this symptom is pronounced and simulates a perinephritic abscess.

Pain and retraction of the testes.—Testicular pain and discomfort occur in about 5 percent of male patients with appendicitis (*4*). The pain is usually not as severe as the abdominal pain, and is described as dull, aching, or sharp. This is probably a referred pain, since the appendix and testes are innervated by the same cord segment. The retraction of the right testis may be caused by direct irritation of the genitofemoral nerve producing a contraction of the cremaster muscle.

Abnormalities of the urine.—A few red blood cells are frequently seen in routine urine specimens of patients with appendicitis. In most cases this is caused by a true periureteritis (*5*) (*6*) (*7*). Frank hematuria that disappears after appendectomy in otherwise typical

cases of appendicitis has also been described. Ehlert (*1*) explained the pyuria similarly. The inflamed appendix in contact with the right ureteral wall produces a periureteritis and ureteritis that results in pus cells being cast into the ureteral lumen, eventually appearing in the urine. Harbin (*6*) believed the pyuria to be caused by a concomitant pyelitis. The appendicitis and pyelitis are thought to be metastatic infections arising from some common focus. Another factor, especially in chronic pyelitis caused by chronic appendicitis, may be a lymphogenous ascent of colon bacilli up the periureteral lymphatic vessels to the kidney. Van Duzen (*7*) listed appendicitis as the probable cause in 7.6 percent of 300 cases of pyelitis. Massive pyuria can occur when an appendiceal abscess ruptures into the bladder. Albuminuria is usually attributed to the pus and red blood cells in the urine.

The patient described in the case report presented an array of urinary symptoms and signs suggestive of a genito-urinary disorder. Although cystoscopy and pyelograms frequently aid in making the correct diagnosis, visual signs of cystitis, ureteritis, or pyelitis would not account for the presence of peritonitis. The wisdom of early laparotomy in this type of case is well substantiated by the unfortunate result in the case reported by Ehlert (*1*). Acute appendicitis which can usually be easily recognized and diagnosed in its typical textbook form may also present a problem calling for the greatest diagnostic acumen.

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Air Pollution

WAYNE G. BRANDSTADT, *Colonel, MC, U. S. A.*

THE sharp increase in deaths from respiratory diseases during and following prolonged heavy concentration of smog in Donora, Pa., in October 1948 has focused increased attention on the problems of air pollution. One result was the calling of a U. S. Technical Conference in Washington on air pollution on 3, 4, and 5 May 1950 by President Truman. This conference was sponsored by the Interdepartmental Committee on Air Pollution consisting of representatives from the Departments of Interior, Army, Navy, Air Force, Agriculture, and Commerce, and the Public Health Service, and the Atomic Energy Commission. In his letter to the Secretary of the Interior, President Truman said:

> The contamination of the atmosphere and its potential adverse effects on health, industry, agriculture, and natural resources are causing wide concern. The agencies of the Federal Government are being called upon to assist private, State, and municipal interests in finding a solution of the air pollution problem.

The conference was divided into panels composed of outstanding authorities in (*a*) agriculture, (*b*) analytical methods and properties, (*c*) equipment, (*d*) health, (*e*) instrumentation, (*f*) legislation, and (*g*) meteorology. These panels and large audiences of visitors were addressed by a series of speakers. The total registration including visitors was about 690. A complete record of the proceedings will be published later.

Air pollution may be defined as the presence in the atmosphere of substances not ordinarily found there or the presence of ordinary constituents of the air in greater than usual concentrations. Air pollution may, therefore, occur in varying degrees and some pollutants are naturally more important than others as regards their effect on health. Pollutants may be classified as (*a*) inert smokes and dusts, (*b*) mucous membrane irritants of which sulfur dioxide is the most important, and (*c*) malodorous substances.

Air pollution has been with us since the beginning of time and is always aggravated by processes involving incomplete combustion. The human activities that give rise to air pollution are (*a*) industrial processes, including coal-burning locomotive engines, (*b*) improper

stoking of furnaces in homes and other nonindustrial buildings, and (*c*) automobiles, probably in that order.[1] Other sources are dust storms, volcanoes, and pollinating plants. We should not lose sight of the fact that water vapor itself in excessive amounts is an air pollutant and has an adverse effect on persons with skin disease, asthma, arthritis, and mentally depressed states.

Although there is general agreement among sanitary authorities that a heavy concentration of smoke is harmful to health, it must be admitted that this opinion is supported by very few controlled observations[2] and that more attention is often given to the physiologically harmless, obnoxious or malodorous pollutants than to those adversely affecting health. This will always be so and with good reason but should not divert our attention from the more important task of safeguarding health. The greatest need appears to be for more effective knowledge concerning (*a*) the means of measuring the concentration of various air pollutants, (*b*) the maximum concentration which will not result in acute and chronic disease,[3] (*c*) the ways air pollution may damage plants and animals, and (*d*) the best means of preventing such damage. The time has come for definite and effective action based on exact knowledge if we are to preserve our heritage of relatively fresh air.

The direct effect of smoke or any of its constituents in amounts that may ordinarily pervade the atmosphere of our cities has not been shown to be detrimental to persons of average health.[4] The direct effect of smoke on those who are ill has been most extensively studied in connection with tuberculosis and pneumonia. It appears that smoke does not in any way stimulate the onset of tuberculous processes or militate against recovery when this disease has been contracted. In the case of pneumonia the effect may be seriously detrimental. In addition to these direct effects, rickets may result from the diminution of sunlight associated with smoke and fog. The general physical tone is lowered and mental depression is increased as a result of long exposure to polluted air. Epidemiologic and statistical studies leave no doubt that deaths from pulmonary and cardiac diseases increase

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[1] McCORD, C. P.: The physiologic aspects of atmospheric pollution. Indust. Med. Surg. 19: 97–101, Mar. 1950.

[2] ALEXANDER, I. H.: Smoke and health. Cincinnati J. Med. 22: 492–501, Jan. 1942.

[3] Definite damage can be demonstrated following short exposures to high concentrations of certain chemicals in the air but it is much more difficult to measure the damage, if any, resulting from long exposure to low concentrations of these same agents. Furthermore, we do not know much about the possible synergistic action of several toxins at levels that are individually allowable.

[4] MONNETT, O.; PERROTT, G. ST. J.; and CLARK, H. W.: Smoke-abatement investigation at Salt Lake City, Utah. U. S. Dept. of Commerce, Bur. of Mines Bull. 254, 1926.

in direct proportion to the duration of a heavy smog. In investigating the Donora disaster it was found that a dangerous atmospheric concentration of pollutants resulted from a combination of density, humidity, and decreased velocity of air currents and not from the latter factor alone.

Unfortunately, the air passages are not an efficient dust filter. It has been shown that in quiet breathing from 2.5 to 7 percent and in deep breathing 20 percent of the inspired dust reaches the lower lung spaces. Nose breathing protects only partially against dust.[5]

In general the remedies for air pollution in industry may be classified as collection, dilution, incineration, and change in process. All of these measures involve added expense that in some cases make them prohibitive. Control is an engineering problem because, although the removal of sulfur dioxide from the air is not difficult, the disposal of tons of byproducts is. Complete elimination of air pollution is rarely, if ever, attainable. The aim is to strike a balance between the right of industries to reasonable operation and the community's demand for a decent environment, not losing sight of the community's need for the economic support of the industries involved. Better public relations between the industries and the community would in many cases facilitate a solution to these problems. Legislation alone will not clean the air, and mutual understanding coupled with cooperation will lead to better results than punitive measures.[6]

The literature on this subject is so widely scattered and appears in so many publications not strictly medical in nature that the Public Health Service has compiled a useful annotated bibliography that is divided into sections on pathologic effects, discussions of individual pollutants, localities studied, reduction of ultraviolet light, effects on plants, sources of pollution, bacteria in the air, weather, history, and a general review. It contains abstracts of 341 papers from foreign and domestic journals.

This is a matter that touches many fields of endeavor and concerns us not only as physicians but also as citizens.

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[5] Report of advisory committee on atmospheric pollution on observations in the year ending March 31, 1922. H. M. S. O. 42, 1923. (Abstr. J. Indust. Hyg. 5: 145, Nov. 1923.)

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Panorama of Naval Medical Research

CHRISTOPHER C. SHAW, *Captain (MC) U. S. N.*[1]

MILITARY medicine deals with medical problems peculiar to the Armed Forces. It is a general specialty which embraces all phases of medicine, surgery, hygiene, sanitation, preventive medicine, and medical logistics. It must embody sound knowledge not only of basic principles, but also of practical means for the application of modern technologic and engineering advances as they affect human welfare, both physical and psychologic.

The fields of investigation in the province of the military surgeon are not limited to clinical methods alone but must encompass the whole gamut of basic sciences as applied to medical and surgical problems, wherever combat may occur in torrid, temperate, or arctic latitudes on land and sea and in the air, and in the waters under the surface of the sea.

Since early colonial days, the military surgeons and the medical services of our combatant arms have made outstanding contributions to the treatment and prevention of disease. In 1775 Surgeon John Jones published Treatment of Wounds and Fractures, the first treatise in America on military surgery. Doctor Benjamin Rush of Philadelphia, a signer of the Declaration of Independence, became Surgeon General of the Revolutionary Army. He was the first military surgeon in history to insist on "variolation" or inoculation of all hands against smallpox. In this primary principle in preventive medicine, he was upheld by General George Washington, probably because the latter in his youth had nearly died from this disease, the scars of which "pocked" his face until his death.

In this period of our founding as a Nation, knowledge of the causes and control of disease was primitive. In those times there was complete ignorance of bacteriology and hence no grasp of the principles of antisepsis or of aseptic surgery. Surgeons expected infection to follow every operation and spoke and wrote of "laudable pus," in utter

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ignorance that this must have been caused by infection from microbes introduced unwittingly by the surgeon himself or by his assistants. Indeed, ether anesthesia was not accepted by the medical profession until 1846. Pasteur of France, Koch of Germany, and Lister of England were comparatively young men during our Civil War; their epochal discoveries in the "germ-theory" of disease did not appear until a generation later. Their achievements stemmed from research and investigation stimulated in part by the exigencies of wars in Europe and continued in the laboratory during periods of peace. Their contributions to scientific knowledge are considered fundamental in medical research, and the application of their principles is accepted as the basis of modern medical practice.

Seventy years ago a naval laboratory was established at Washington, D.C., to conduct research in the fields of medicine that were of special interest to the Navy. In 1880 Congress appropriated $1,500 for the support of an investigation of the relationships between atmospheric impurities and disease. The findings from this research project were used in redesigning the ventilation system of Navy ships in 1882. As far as is known, this marks the first "official" recognition and financial support of naval medical research in this country. This was followed in 1893 by the founding of the Naval Medical School principally for research in tropical medicine and for the training of medical investigators. Continuous interest and effort devoted to naval medicine and related research culminated in the establishment of the National Naval Medical Center at Bethesda, Md., in 1941.

NAVAL MEDICAL RESEARCH INSTITUTE

Situated on the rolling countryside to the west and north of the District of Columbia, some 4 miles from the District Line, the Naval Medical Research Institute, hereinafter referred to as NMRI, is an integral part of the National Naval Medical Center. The contributions to research made there during the war by medical officers and a few specially trained civilian scientists beggar description. Many practical solutions to problems of food preservation and packaging, nutrition and nutritional deficiencies, survival rations, water purification and potability, clothing for tropical or arctic duty, submarine or aviation assignments, deck watches in foul weather or fair, flotation gear, rescue and survival, night vision, sunburn protection, resuscitation, malaria control; all these and many other problems were studied and intensively investigated and answered, in whole or in part. The saving in lives and equipment and the preservation of morale, stemming either directly or indirectly from this type of medical research, can scarcely be estimated, much less computed. Indeed, the research effort at NMRI still continues apace.

The mission of NMRI is to further research in medicine and in fields allied to medicine for the purpose of improving naval medical practice as it is concerned with protection of personnel against injury, the prevention of disease, and the treatment of the ill and injured. Special consideration is also given to the training of medical personnel in research methods and to the provision of opportunities for qualified naval officers to participate in medical investigation.

Research undertaken at the Institute at the present time embraces such projects as the medical aspects of ionizing radiation, the study of the characteristics of the body that enable it to withstand high impact forces encountered in modern aviation, and the prevention of crash injuries. The biologic effects of vibration, both subsonic and ultrasonic, are being studied in small animals. An investigation of a recent epidemic of dysentery in the Fleet is producing important facts concerning the causes and means of control of such diseases both ashore and afloat. An extensive program of dental research with special emphasis on the influence of diet on the development and the prevention of dental caries is underway. Original studies of the circulation in the brain of the monkey by means of plastic or lucite caps replacing a large portion of the skull provide excellent observation of living brain tissue. The sleep-wakefulness cycle is being investigated under controlled conditions of fatigue, with special reference to watch standing aboard ship. In addition, a study of the facilitation of learning in lower animals and in man is producing basic data which should be of great significance in the training of personnel in the specialized techniques of modern naval warfare. The effects of too rapid decompression from high atmospheric pressures (submarines) and at extreme altitude (low pressures in the stratosphere) are under constant investigation to determine ways and means to prevent the formation of gas bubbles in the tissues of the body. This condition is known as "decompression illness" in deep-sea divers, and as "altitude sickness" in aviators. Other investigations of a classified nature are being conducted on a continuing basis.

During the war emphasis was, perforce, placed on applied or practical research designed to answer specific problems in the field or aboard fighting ships. Since cessation of hostilities, much of the research at NMRI has been fundamental in nature to replenish our stockpile of basic data in the disciplines of physiology, psychology, pharmacology and their adjunctive sciences.

NAVAL SCHOOL OF AVIATION MEDICINE AND RESEARCH

The School of Aviation Medicine, U. S. Naval Air Station, Pensacola, Fla., was founded in 1939 to indoctrinate and train aviation

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medical examiners and flight surgeons and to investigate personnel problems pertaining to the actual control of aircraft.

Formal research work in aviation medicine began at Pensacola in July 1940 when a group of investigators under Navy and National Research Council sponsorship intensively studied methods of pilot selection. In July 1942, the Physiological Section was organized and since that time many studies have been carried out on respiration and high-altitude physiology. The following year the research laboratory was commissioned, and in July 1944, the Acceleration Unit containing a human centrifuge was authorized. Before the end of the war, research activities were carried on at a peak rate. Arrangements were made for an acoustic laboratory to study the noise spectrum of Navy planes and to elucidate the problems of interference with transmission of the human voice over intercommunication systems. Research on these problems still continues in an active status.

In the psychological laboratory the psychology of aviation in general and of aviators in particular is intensively investigated. The altitude training unit for indoctrination of aviation cadets consists of three chambers, two of which can be rapidly refrigerated to simulate the cold, in addition to the lack of oxygen encountered at extremely high altitudes, thus duplicating the actual physiologic environment of the stratosphere. The current research program at the School of Aviation Medicine and Research in Pensacola also concentrates on the solution of the problems of disorientation of pilots in relation to space.

Active research affiliation is enjoyed with the Department of Psychology, Tulane University; Department of Speech, Ohio State University; Department of Biochemistry, Graduate School of Medicine, University of Pennsylvania; the Departments of Physiology, Anatomy, and Pathology, Emory University; and the Florida State Department of Health.

U. S. NAVAL MEDICAL RESEARCH LABORATORY, NEW LONDON, CONN.

Since 1941 medical research has been an integral activity of the U. S. Naval Submarine Base, New London, Conn. On 23 February 1944 the U. S. Naval Medical Research Laboratory was commissioned at this facility to augment the effectiveness and efficiency of the submarine service by basic, applied, and developmental research with special reference to the factors of human tolerance. The availability of submarines, submarine tenders, and rescue and salvage vessels operating out of New London makes field testing of equipment highly practicable. Studies of health and habitability for the protection and comfort of the crew were and are made aboard submarines on

patrol by authority of the Assistant Chief of Naval Operations for Undersea Warfare.

The sound section of this laboratory is equipped to do original research in pure tone discrimination, on auditory fatigue, and on problems in the selection of sonar operators. The visual section of the laboratory concentrates on the recognition of targets subtending various angles and at variable degrees of illumination. The submarine escape training tank offers unique opportunity for the development and trial of technics of escape from submerged vessels and of related safety equipment for submarines.

This laboratory enjoys affiliation liaison with the scientific research laboratories of Yale University, Harvard University, Connecticut College, Massachusetts Institute of Technology, Tufts College, Brown University, Wesleyan College, and the Worcester Institute of Experimental Biology.

Medical officers are also stationed at the Experimental Diving Unit with additional duty at the Deep-Sea Diving School, both located at the Naval Gun Factory, Washington, D. C. There, physiologic and biochemical research are conducted on problems peculiar to deep-sea diving with special reference to analysis of gases in the natural atmosphere and the gases employed in modern synthetic breathing mixtures which enable expert divers to descend to great depths.

NAVAL MEDICAL FIELD RESEARCH LABORATORY, CAMP LEJEUNE, N. C.

The Naval Medical Field Research Laboratory was founded at U. S. Marine Barracks, Camp Lejeune, N. C., in August 1943. The mission of this laboratory is to perform all types of research, development, and testing pertinent and peculiar to the practice of amphibious medicine. Particular emphasis is placed upon medical problems associated with operations of the U. S. Marine Corps.

Research in matériel is here given high priority, for this facility is the only one operated by the Navy and the Marine Corps for the development and evaluation of medical equipment, supply units, and certain protective devices and clothing peculiar to amphibious warfare. The problem of the selection of suitable personnel is under constant surveillance to provide more effective methods of training officers and men of the Marine Corps to accomplish their specific assignments. Field sanitation, hygienic measures, and preventive medicine receive practical trials at this facility. Further research in body armor, resuscitation, survival, and rescue is expected to yield information of significant value.

Occupational hazards presented in field operations are under continuing scrutiny. Field diets are tested for caloric content, vitamin

assay, and palatability. Exhaustive basic studies of fatigue and the methods of combating this in assault troops are constantly underway. Seasickness aboard amphibious craft greatly reduces the efficiency and fire power of troops upon hitting the beach; therefore, investigations of the causes and control of this malady have been and are continuing to be carried out. Various medications are compared for their prophylactic and therapeutic effects.

The MFRL enjoys affiliation with Duke University, Durham, N. C.; the University of North Carolina, Chapel Hill; and the North Carolina State University, Raleigh.

AERO-MEDICAL EQUIPMENT LABORATORY, U. S. NAVAL BASE, PHILADELPHIA

The Aero-Medical Equipment Laboratory, located at the U. S. Naval Base, Philadelphia, was established in 1943, under the U. S. Naval Air Experimental Station, which is a command of the Naval Air Matériel Center. The mission of this laboratory is to conduct applied research in the field of aviation medicine and to make engineering tests and operational evaluation of equipment necessary to maintain aviation personnel at extreme altitudes, temperatures, and high accelerations. The program carried on by this laboratory concentrates on oxygen equipment, emergency rescue gear, anti-G-suits, cabin conditioning, and flight clothing.

The Aeronautical-Medical Equipment Laboratory (AMEL) consists of a human engineering division which includes the physiological section, an acceleration section, and a vision section. At the U. S. Naval Air Development Center at Johnsville, Pa., under the management control of the Bureau of Aeronautics, a human centrifuge unit now under construction and shortly to be commissioned, is the largest such unit in the world. The function of a human centrifuge is to reproduce the forces of acceleration to which the pilot and passengers of modern military aircraft are subjected during maneuvers at very high speed. The facilities of this Aviation Medical Acceleration Laboratory (AMAL) will be made available to the Army and the Air Force as well as to the Navy. The older laboratory (AMEL) in Philadelphia enjoys a cordial working relationship with the University of Pennsylvania in the field of physiology and psychology. Novel studies of the nervous system of experimental animals exposed to the vibrations of jet engines are underway. Princeton University is also collaborating on certain animal investigations in connection with various hazards inherent in engine test cells. Many universities and industries throughout the country have indicated their keen interest and eventual participation in one or more portions of the proposed research program for AMAL at the U. S. Naval Air Development Center at Johnsville.

PHYSIOLOGICAL TEST SECTION, NAVAL AIR TEST CENTER, PATUXENT RIVER, MD.

This activity was established in 1944 by the Secretary of the Navy on recommendation of the Chief of the Bureau of Aeronautics and the Surgeon General. The mission of this facility is to test in the laboratory and in actual flight the equipment designed at Philadelphia and elsewhere to minimize hazards to personnel engaged in high altitude flight, to test proposed equipment for the protection of aviation personnel from various toxic agents (jet propulsion fuels), and to provide aeromedical consultation for the Naval Air Test Center at Patuxent and other naval aviation activities. Controlled conditions in the laboratory may simulate certain flight conditions but the crucial test of men and equipment occurs only during operational flights or in actual combat.

The physical facilities and the aircraft available at the Naval Air Test Center provide this activity with the broadest opportunities for carrying out its assigned mission. Physiologic research is carried out here under actual operating conditions during routine flight testing of the newest and most modern aircraft.

AMPUTATION CENTER, U. S. NAVAL HOSPITAL, OAKLAND, CALIF.

Shortly after the attack on Pearl Harbor, amputees began arriving at the U. S. Naval Hospital, Mare Island, from the Pacific theater. The need for an amputation center to rehabilitate such war casualties soon became pressing. At the same time such a center would bring together the wounded patient, the orthopedic surgeon, the limb fitter, and the rehabilitation specialist. In 1943 the Surgeon General, therefore, designated the U. S. Naval Hospital, Mare Island, Vallejo, Calif., as an amputation center, the first to be commissioned and placed in operation on a comprehensive scale in the Armed Forces. A modern facility was especially planned and constructed for the manufacture and fitting of artificial limbs, allied prosthetic devices, and research therein.. To November 1948, 2,200 amputees were processed through this facility. In 1945, the maximum census was over 1,800 patients; during that year alone the artificial limb department produced over 600 prosthetic limbs in addition to 500 orthopedic braces. Extensive facilities and special equipment now in operation at the U. S. Naval Hospital, Oakland, Calif., make this Center outstanding in its field. This was made possible through the helpfulness of the Departments of Engineering of the University of California, at Berkeley and at Los Angeles.

The mission of the Amputation Center is to conduct research on and development of orthopedic limbs and artificial appliances and to maintain working liaison with the Committee on Artificial Limbs of the

National Research Council, which correlates the prosthetics program of the Armed Forces. The prosthetic surgical files transferred from the U. S. Naval Hospital, Mare Island, to the U. S. Naval Hospital, Oakland, in 1950 contain extensive data on former patients and reflect the march of research progress in orthopedics. They comprise the most comprehensive pool of information on the development of artificial limbs and orthopedic braces in this country. Collaborative relationships are maintained by this Naval Amputation Center with the Army, the Air Force, the Veterans' Administration, and the prosthetic limb industry. Truly, this is a monumental contribution to rehabilitation accomplished through naval research in medicine and surgery.

NAVAL RADIOLOGICAL DEFENSE LABORATORY, SAN FRANCISCO NAVAL SHIPYARD

As a result of Operation Crossroads great emphasis was given to atomic research and its medical aspects. In November 1946, the Radiological Defense Laboratory was established by several Bureaus in the Navy with the general objective of finding means of minimizing the hazards and dangers of nuclear radiation, including decontamination of exposed matériel and personnel. A primary mission of this unit, therefore, is to study the medical aspects of human defense in atomic bomb and radiologic warfare. This laboratory is under the administrative control of the Bureau of Ships and enjoys working liaison with the Atomic Energy Commission and the Army Corps of Engineers. Other supporting naval Bureaus are: Medicine and Surgery, Yards and Docks, and Aeronautics, each of which has technical cognizance over certain portions of the program. At present the biologic and medical divisions maintain 10 laboratories, 7 for biologic research and 3 for medical service.

The biologic-medical research program encompasses the determination of maximum permissable dosage of radiation (both internal and external) under varying military situations, internal radiation toxicity studies, analysis of the nature of radiation sickness, including its treatment, and the development and testing of radiologic safety devices and procedures. These phases of the program are under cognizance of the Atomic Defense Division of the Bureau of Medicine and Surgery which also administers the Atomic Energy Medical Division of the Naval Medical Research Institute, Bethesda, Md. The programs of these two facilities are, therefore, closely integrated. Through the Bureau of Medicine and Surgery liaison is maintained with other cognizant bureaus of the Navy, the Armed Forces Special Weapons Project, and the other Armed Services, as well as with the Division of Biology and Medicine of the Atomic Energy Commission. Close cooperation with the AEC and its various installations allows access to

restricted data, materials, and publications. Stanford University and the University of California have made their scientific libraries accessible to the personnel of the Naval Radiological Defense Laboratory.

NAVAL MEDICAL RESEARCH UNIT NO. 1

The Naval Medical Research Unit No. 1 (NAMRU–1) was established in the Department of Bacteriology, University of California (Berkeley) early in the 1930's to enlist the services of the University's scientific staff members and graduate students in building a research organization to undertake investigations of interest and importance to the Medical Corps, U. S. Navy, in time of national emergency. The organization and function of this unit were described in the Military Surgeon in 1937. This unit was then known as the Naval Laboratory Research Unit No. 1. Personnel of the unit volunteered for active duty in January 1941, at which time the Surgeon General of the Navy authorized NAMRU–1 to embark on a program of research relating chiefly to respiratory diseases and their control.

Continuing investigations proved that virulent organisms (bacteria and viruses) could be studied safely with the proper equipment. Special protective clothing was devised for use in dangerously contaminated environments. Sterilization of air was obtained by incineration of all suspended organic matter. Protective hoods were devised for the routine testing of cultures of bacteria and the isolation of micro-organisms without contamination of the bacteriologist or his assistants.

By virtue of these methods, defense against the disease-producing capacity of bacteria and viruses was intensively studied, and means were also developed for investigation of airborne contagion under completely controlled climatic conditions of selected temperatures and humidities. The efficacy of vaccines and the evaluation of chemotherapeutic and antibiotic agents were established by experimental methods. Many factors were discovered concerning the rise and decline of laboratory epidemics and their bearing on some of the major and most pressing problems in preventive medicine.

After the war, the Office of Naval Research authorized a "task" within the structure of the Department of Bacteriology of the University of California for the purpose of carrying on strictly academic investigations in the field of airborne infections. An important element in the conduct of this experimental program has been the continuation of NAMRU–1 as an integral part of the project. This research unit currently serves as a nucleus for expansion because it has at its disposal uniquely trained personnel with a considerable backlog of experience in this field.

NAVAL MEDICAL RESEARCH UNIT NO. 2

The Naval Medical Research Unit No. 2 actually originated in Washington, D. C., at the Bureau of Medicine and Surgery, on 24 July 1943 when a conference was held to discuss tropical diseases occurring in service personnel stationed in the South and Southwest Pacific. Following this conference a survey was made of the areas adjacent to the fighting fronts. As a result of this survey, it was recommended that a mobile naval medical research laboratory be established in the South Pacific in order to study the diseases of military importance in the area and to be prepared to undertake investigations of tropical diseases that might become troublesome in the future.

The Secretary of the Navy on 12 January 1944 authorized the U. S. Naval Medical Research Unit No. 2 as "an integral organization with specially trained personnel and all items of equipment and supplies necessary to establish and operate a laboratory in the Pacific to study diseases of military importance." In accordance with this order, the Chief of Naval Operations on 26 January 1944 issued a directive establishing the Unit to "comprise approximately 150 research personnel plus such additional nontechnical personnel as is required for its support, plus such supplies and equipment as are necessary to carry out its mission."

The complement of this unit included 44 officers and 251 enlisted men, 134 of whom were hospital corpsmen with special training and ability in the fields of bacteriology, clinical chemistry, pathology, parasitology and helminthology, hematology, serology, photography, pharmacy, clerical, property and accounting, dental, physical education, and general service. The initial outfitting list included 4,500 items which weighed 1,418,716 pounds and occupied 64,656 cubic feet of shipping space.

During the period of construction of the main unit on the island of Guam from 12 January to 9 May 1945 the scientists attached to NAMRU–2 were far from idle. Application of DDT in the field began immediately and a spray apparatus for the dispersal of DDT from torpedo bombers (TBF, TBM) was devised. Airplane sprays were introduced throughout our Pacific Island holdings and even during the Okinawa campaign prior to actual possession. An outbreak of scrub typhus was investigated and brought under control. Several new species of mites and chiggers were discovered which carry the organisms which produce this disease. Taxonomic problems regarding the vectors of malaria in the South Pacific were intensively studied and many were solved. In addition, several new species of mosquitoes were discovered, reported, and brought under control by

DDT. Infectious diseases among the natives of Guam were investigated and much was learned about the clinical course of infectious hepatitis, a contagious disease of the liver of viral origin causing a high rate of morbidity in our military personnel.

Field teams were organized to instruct our troops in those diseases which might be encountered during the coming campaigns, a preventive measure which paid off handsomely in lives saved and efficiency maintained. A branch laboratory was set up on Okinawa by the middle of April 1945. Here, the presence of filariasis was determined and measures were taken to prevent its spread to military personnel. It was also learned that no snails capable of transmitting schistosomiasis were present on Saipan, Tinian, or Guam. Outbreaks of dysentery in the Philippines were studied bacteriologically and brought under control. The so-called Okinawan fever which was believed to be a form of scrub typhus was diagnosed in the laboratory as a form of paratyphoid fever.

In the clinical hospital, studies were made on the intravenous administration of amino acids (from which proteins are derived) to severely wounded and burned patients. Many lives were saved by this measure. Other clinical investigations were also conducted with encouraging results, as in the case of the epidemic form of Japanese encephalitis on Okinawa. The outbreak of this viral infection of the central nervous system was the sharpest and greatest challenge to the unit. Within a short time after its appearance, however, the causative agent of the epidemic was identified as a virus and it was learned that antibodies against this virus were present in the serum of horses, goats, chickens, ducks, and infant mice and rats on Okinawa. This meant that these animals served as reservoirs of infection. Further investigation demonstrated that the virus of Japanese encephalitis was transferred to these animals and to man by the bite of three different species of infected mosquitoes. By destroying these mosquitoes, therefore, the spread of the disease was brought under control.

The work of this Unit was reported in 87 scientific articles which were published on investigations carried out at NAMRU–2 from January 1945 to January 1946.

On 15 March 1946, the U. S. Naval Medical Research Unit No. 2 was redesignated the U. S. Naval Institute of Tropical Medicine, a unit of the Naval Medical Center, Guam. (Other units of this Naval Medical Center consist of the U. S. Naval Hospital, the Guam Memorial Hospital, a medical supply depot, and three training schools for natives, one for medical assistants, one for nurses, and one for dental technicians.)

Additional research activities in tropical medicine arising from the impetus of NAMRU–2 are located among the mandated islands. They include a controlled study of therapy of filariasis with some of the newer chemotherapeutic drugs in the native population at American Samoa. This is a cooperative project between scientists of the Naval Medical Research Institute, Bethesda, and the School of Hygiene and Public Health of Johns Hopkins University, Baltimore. At Tinian Island the Navy maintains a leprosarium where a naval medical officer and his wife, who is also a physician, administer modern antibiotics and other chemotherapeutic agents to 100 natives suffering from leprosy. The U. S. S. *Whidbey* is currently conducting a medical survey of the native population among the mandated islands. On Majuro Atoll in the Marshalls, the Navy cooperated with the Army Medical Department in a pioneer program of water purification using iodine to supplement chlorine for sterilization of the entire local water supply. As far as is known this is the first extensive field trial of iodine for water purification in the history of public welfare and safety and marks a milestone in the progress (and practice) of public health.

But times are changing rapidly. By Executive Order 10077 of 7 September 1949, the Department of Interior was designated the civilian agency with general supervision over and responsibility for civil administration of the island of Guam and our Pacific trust territories instead of the Navy. Because it is the announced aim of the Department of Interior to accord civil government and a full measure of civil rights to the residents of Guam and our Pacific trust territories, it is anticipated that the Navy will relinquish most of its medical research and other interests in this area on completion of the projects now being worked on.

U. S. NAVAL MEDICAL RESEARCH UNIT NO. 3, CAIRO, EGYPT

Naval Medical Research Unit No. 3 (NAMRU–3) was established in Cairo, Egypt, on 15 January 1946 by the Secretary of the Navy. The Unit absorbed the facilities and equipment of the United States of America Typhus Commission and its successor, Naval Epidemiology Unit No. 50. Its mission is to conduct medical research and investigation in the Near and Middle East, Africa, Europe, and India on diseases and medical problems which, although rare in the United States, are of importance to military forces operating in tropical and semitropical regions.

In June 1948 the Royal Egyptian Government granted a lease to the U. S. Government for a 2½-acre tract of land adjacent to the 1,000-bed Abbassia Fever Hospital for a 25-year period at a token fee. NAMRU–3 dedication ceremonies took place on Navy Day, 27 October 1948. The guest list for this auspicious occasion included all the high

echelon medical men in the Royal Egyptian Navy, the Royal Egyptian Army, and the Egyptian Ministry of Public Health.

NAMRU–3 has remodeled existing buildings and erected eight new buildings which were ready for occupancy in July 1949. There are 25 structures in all, including the various services buildings. The laboratories house departments of bacteriology, biochemistry, entomology, parasitology, physiology, dental research, and virology. Two separate wards are provided, each with a 25-bed capacity for intensive clinical investigation of tropical diseases. An adequate reference library of medical and scientific books and journals is under way.

During the past 2 years medical and allied scientists on the staff of NAMRU–3 have completed an intensive clinical and laboratory study of patients suffering with cholera. The intravenous administration of a sterile combination of isotonic sodium chloride and sodium bicarbonate, adjusted to the alkalinity of the blood stream, was found extremely effective in the treatment of this disease.

The immediate and future results of research can best be judged by the number and type of scientific publications based on original investigations undertaken at a research facility. In the case of the Naval Medical Research Unit No. 3 in Cairo, 29 scientific and clinical articles have been published in the medical literature during the past 4 years. Eight additional investigations in biochemistry will be reported during the current year. Thirteen scientists are presently working on some 21 different research problems in tropical medicine. These projects are nearing completion and the reports will subsequently be published in medical and other scientific journals. Furthermore, 26 fundamental investigations are under way in the naval laboratories at Cairo.

It is expected that qualified medical scientists from the Army, the Air Force, and the U. S. Public Health Service will be assigned, eventually, to the NAMRU–3 laboratories. It is hoped that through the provisions of the Fulbright bill eminent scientific scholars of this country may go to NAMRU–3 to study while on leave. They would take with them one or two graduate fellows from the United States to work cooperatively with graduate research fellows assigned by the Egyptian Ministry of Health. Such a cultural and scientific collaboration between the U. S. Navy, the Royal Egyptian Government, and United States civilian scientists would implement the brotherhood and fraternity of medical science and research and thereby should be helpful in fostering good international relations.

NAVAL MEDICAL RESEARCH UNIT NO. 4

The Naval Medical Research Unit No. 4 (NAMRU–4) was established on 1 June 1946 at the U. S. Naval Hospital, Dublin, Ga., for

research on rheumatic fever. On 1 July 1948 the unit was relocated at the U. S. Naval Training Center, Great Lakes, Ill., and on 14 June 1949 was dedicated by the Surgeon General.

The mission of NAMRU-4 is to develop effective means for the control of acute communicable respiratory diseases and to conduct both laboratory and clinical studies in the causes and progress of rheumatic fever among military personnel. The research program of this Unit is designed to utilize to the fullest extent the unique opportunities for field research presented among recruits assigned to the Naval Training Center. The principle aim of this program is to stimulate, guide, and support clinical and epidemiologic studies, and to provide facilities so that the diagnosis of communicable diseases of the respiratory tract may be standardized on an etiologic basis, rather than on the somewhat vague symptomatic or anatomic classifications now in common use. This locale also provides a wealth of material for the investigation of the relationship between acute respiratory diseases and the development of rheumatic fever.

Field studies on the control of these diseases constitute an important part of the research program at NAMRU–4. The continued availability of homogeneous populations at this training center provides unique opportunities for controlled clinical research. The present research agenda embraces investigation of the effects of glycol vapors on air sterilization, the control of dust in barracks and aboard ship, the problems of cross-infection among personnel in close quarters, immunization procedures, treatment of contagious infections by chemotherapeutic and antibiotic agents, and the action of the antihistamines in preventing or aborting the common cold. Further opportunities are here present for recording the physiologic adjustments of young men and women under the impact of transition from civil to military life.

The main research laboratory is responsible for providing adequate diagnostic support to the field studies and at the same time for continuing fundamental research on the problems lying within the scope of this unit's mission. Adequate facilities are rapidly being developed for bacteriologic, immunologic, and virologic research plus such biochemical studies as are indicated. Collaborative research is being initiated with the Medical Schools of the University of Chicago, the University of Illinois, Northwestern, and Loyola Universities.

OFFICE OF NAVAL RESEARCH

The Office of Naval Research, established in 1946, underwrites and administers an extensive program of fundamental research in the

basic and allied sciences which is of great interest to the Bureau of Medicine and Surgery. The magnitude of this undertaking becomes apparent when it is realized that in addition to the home office in Washington, ONR maintains administrative offices in Boston, New York, Chicago, San Francisco, Los Angeles, and London. Their over-all prospectus covers the physical, medical, and naval sciences to provide a reservoir of knowledge essential to the continuance of naval strength and efficiency.

Contract research farmed out by the Office of Naval Research to qualified investigators at leading university laboratories may be classified into three main categories: the "basic" physical sciences, the strictly military or naval sciences, and the biosciences. Examples of research in the basic scientific field must include investigations in physics, chemistry, geophysics, electronics, mathematics, nuclear physics, fluid mechanics, mechanics, and materials. In the military sciences emphasis is concentrated in the broad categories of air, armament, power, undersea, and amphibious warfare.

Investigations in the biosciences are conducted in two administrative categories, the Biological Sciences Division and the Human Resources Division. In the former category fall studies in physiology, biophysics, biochemistry, biology, microbiology, and research in dentistry and oral surgery. The Human Resources Division is responsible for research in psychophysiology, manpower, morale (psychologic warfare), human relations, personnel, and training. This Biosciences Group of ONR sponsors contract research in those subjects at more than 100 universities, medical schools, and teaching clinical centers throughout the country.

The rationale of such an extensive research syllabus lies in the indisputable fact that the nation's strength and welfare, both in war and in peace, are dependent upon our scientific and industrial progress. The security of our country is directly related to the degree of our interest and activity in research, whether this be basic or applied, because both forms of investigation serve a common purpose: the creation of new knowledge. Nor can the one exist without the other; basic and applied research are in no way antagonistic. Indeed, they are complementary and, in a sense, reciprocal as shown by their definitions, promulgated by the Office of Naval Research:

Basic research is a theoretical or experimental study directed toward the increase of knowledge. It may result in the discovery of new scientific phenomena, principles, techniques, or significant data. Immediate practical application is not a direct objective of the investigator. Such practical applications, either immediate or in the future, may however be a concern of the sponsoring service.

Applied research may be defined as research directed toward a practical end. Its aim is to make possible or demonstrate the feasibility of scientific or engineering developments, which are the fruits of "basic" investigations. It is research which by use of novel methods or by new application of known methods ordinarily precedes and results in the development of devices, material, or techniques, preferably of military or industrial value. The term "development" refers to the application of scientific or engineering knowledge to the production of materials, devices, systems, or processes having useful functions and performance characteristics.

CLINICAL RESEARCH

In 1948 the Surgeon General officially encouraged clinical research at naval hospitals, dispensaries, and aboard ship by qualified and interested medical officers. The response during the past 2 years has been gratifying, with credit to the cooperation of our senior and junior medical officers and by virtue of the expert advice of our outstanding civilian consultants, who are certified specialists in the various branches of medicine and surgery. The development and operation of a preserved bone and tissue "bank" (based on the principle of the blood bank) at the U. S. Naval Hospital, Bethesda, is an example of recent progress in clinical research.

SCIENTIFIC ADVISORS

In the spring and summer of 1949, two eminent scientists were appointed on a full-time basis: Kenneth S. Cole, Ph. D., former professor of biophysics in the Institute of Radiobiology and Biophysics and in the Department of Physiology, University of Chicago, to serve as technical director of the scientific program of the Naval Medical Research Institute; and, Dr. Howard T. Karsner, former professor of pathology and director of the Institute of Pathology, Western Reserve University, Cleveland, as medical research advisor to the Bureau of Medicine and Surgery. Their broad and wise counsel based on top-flight university careers in teaching, independent investigation, and writing are already proving to be of inestimable value in crystallizing policy and stimulating both fundamental and clinical research in the science and the art of naval medicine.

PROCEDURE

The Navy recognizes that tight administrative restrictions in research are incompatible with the greatest scientific progress. That is why the Medical Department prefers that ideas, proposals, and projects in medical research originate at the periphery and be forwarded via the chain of command to the Chief of the Bureau of Medicine and Surgery. Ideas generated by research workers in the field, studies requested by other bureaus of the Government, and certain investigations suggested within the Medical Department of the Navy are considered as proposals and carefully analyzed as to their

experimental design. Appraisal, coordination and review of all proposals are undertaken in the Research Division of the Bureau of Medicine and Surgery and, where applicable to the primary mission of the Medical Department in support of our combatant arms, such research projects are approved by the Surgeon General. The projects are then referred to the cognizant facility for implementation. Reports of progress are made to and by the Bureau of Medicine and Surgery. Publication of results, on approval, may appear in an official bulletin or be released to an appropriate civilian or military medical journal, or may be released to the lay press after publication in a scientific journal. By this means a constant flow of ideas and medical discoveries is assured the naval service.

PROGRAM GUIDANCE

The Division of Medical Sciences of the National Research Council, upon request of the Surgeons General, reviews various phases of the medical research programs of the Army, Navy, and Air Force and provides advice to the Bureau of Medicine and Surgery in its specialized areas of interest. Arrangements are now being made whereby outstanding medical scientists from the National Research Council will visit and consult with naval medical investigators at the working level. The investigator will benefit from this personal relationship and the civilian representative from the National Research Council will become familiarized with the program, methods, and extent of the naval medical research establishment, which now employs a total of 82 civilian scientists and 84 investigators wearing the uniform of the United States Navy.

The Committee on Medical Sciences of the Research and Development Board provides not only guidance but coordination for the medical research programs of the three Services within the Department of Defense. The purpose of this program guidance is to ensure that the medical research efforts of the Navy will coordinate with and not needlessly duplicate similar programs of the Army and Air Force. Recommendations and reports from the various panels upon which committee structure is based are considered by the Committees of the Research and Development Board and form their basis for program guidance, coordination, and budget reviews. Within the Department of the Navy, the research program of the Bureau of Medicine and Surgery is correlated by the Research and Development Review Board to meet the operational requirements of the naval service.

RATIONALE

The reader may pause at this juncture to ask why so much time, effort, and treasure are assigned to research in military medicine with

special emphasis on basic research. During periods of armed conflict, the exigencies of war require immediate application of new methods, weapons, and practical means of defense against them. Advances in military medicine must then be confined to applied research and development. But as time marches on, our stockpile of science and of scientific talent must be increased between wars by basic research, which can be pursued to best advantage during periods of peace when graduate students can be thoroughly trained at universities, teaching hospitals, and at naval research facilities as capable scientific investigators.

Research as such may be defined as critical investigation or experimentation to establish or discover new facts. Without research, modern medicine never would have become "modern." If medical research, both basic and applied, were prohibited by lack of funds, facilities, personnel, or vision (or all four), military medicine would promptly wither away.

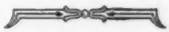
The importance of basic research to the military surgeon must be apparent when we consider the "who, what, when, where, why" of atomic energy. Knowledge of nuclear fission grew to its present formidable estate by virtue of two factors; basic science and teamwork between basic scientists and administrators in devising methods for practical application of fundamental knowledge. The sum total of science is derived from the contributions of many minds, research laboratories, and countries where freedom of thought, freedom in scientific research, and freedom of expression are (or were) considered sacrosanct. This outstanding example of the dependence and interdependence of practical or applied science upon fundamental research and basic investigation in pure science is familiar to all of us. Surely, the Manhattan Project needs no scientific justification.

In the fields of medicine, both military and civilian, the discovery and development of penicillin demonstrate the correlation between basic and applied research and emphasize once again the crucial importance of fundamental investigations in the basic sciences as applied to the healing art. Penicillin was discovered by Sir Alexander Flemming in 1928, but its lifesaving potentialities were not recognized until 1939, when it was determined by other medical scientists that this new drug possessed antibiotic activity. Military necessity then demanded the rapid development of this "product" of basic research in microbiology, so that the manufacture and distribution of a complex chemical compound, considered a mere laboratory curiosity until the Battle of Britain began, had grown to a gigantic industrial endeavor by 1945, when the Rising Sun of Japan foundered beneath the western horizon.

PHILOSOPHY

Fundamental principles derived from laboratory research in the basic medical sciences must be applied in the clinical treatment of the ill or injured patient. Technical data from numerous and diversified engineering laboratories implement procedures in preventive medicine for the control and eradication of tropical and infectious diseases. Hence, the modern military surgeon can fulfill his mission because today's research in medicine and the sister sciences becomes tomorrow's practice, both in peace and in war.

Of arms and the man, man is indispensable. No industrial machine or engine of war has yet been devised better than the personnel who operate it. Thus, man-power is and will continue to be our greatest and our most precious asset. The preservation of man's health, efficiency, and morale has been and will continue to be proportional to the advances in scientific medical research available to the military surgeon in his unceasing effort "to bring light to them that walk in darkness and in the shadow of death, and to guide our feet in the paths of Peace."



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Specialist Training of the Medical Officer, Royal Army Medical Corps

J. M. MACFIE, *Major-General, R. A. M. C.*[1]

THIS article describes briefly the training of the British Army medical officer in special branches of his profession rather than his training in military exercises or staff duties. Its main concern is the training of the officer with a Regular commission, but it will also touch on the advancement of the young practitioner, called up for his period of National Service, and of the medical officers included in the various Army reserves. The Regular officer cadre of the Royal Army Medical Corps (R. A. M. C.) is composed of permanent Regulars and short-service Regulars and it is from the latter only that the former are commissioned. An officer taking a short-service commission engages to serve for 4 years with the active Army and 4 years on the Regular Army Reserve. During his third year of active service he may apply for a permanent commission which is granted by selection and according to the availability of a vacancy in the permanent cadre.

Under peace conditions, as understood before September 1939, practically all medical officers of the Regular Army held Regular commissions. In the present postwar period the Regular cadre is insufficient to meet requirements. During the war and until the end of 1948, the deficiency was made up by officers holding an emergency commission which required them to serve with the Army for an indefinite period governed mainly by service requirements. Some of these officers are still serving but since the beginning of 1949 the Army's requirements have been completed by young practitioners called up for National Service. Generally these have been qualified in their profession for 6 or 12 months and have spent that period in civilian general hospitals. Some may be longer qualified and may have had an opportunity for special training. In all cases they are commissioned for 18 months' full-time service with the Army, followed by 4 years part-time service in the Reserves.

[1] Commandant of the Royal Army Medical College, Millbank, at the time of writing this article and now Deputy Director of Medical Services, Western Command, United Kingdom.

The preoccupation of any Army in peace as regards the individual officer or soldier is training with a view to advancement; and training never ceases. Training requires time. It is obviously not practicable to give much special training to the National Service officer during his 18 months of full-time service. The time is barely long enough for him to learn the job of a general-duty medical officer. Those, however, who have been able to acquire special skill before being called up may be employed on specialist duty and for them training appointments under the guidance of a specialist are provided.

For various reasons, among them shortage of fully trained specialists and wide differences in the scope and responsibilities of authorized specialist appointments, it has been found necessary and convenient to define stages in specialist training.

The *first stage* is that of trainee. It is applicable mainly to officers holding Regular commissions but may, in certain special branches, be granted to National Service officers. A trainee is a general-duty medical officer who has been accepted for training in a specialty and is assigned to a hospital or other medical establishment, in a vacancy for a general duty medical officer. He must take his fair share of general medical work but is given every facility to work in the department of his selected specialty.

Generally speaking, a trainee must be qualified at least 1 year (2 to 3 years if a trainee in certain subjects), have at least 1 year's service in the Army, served 6 to 12 months in an appropriate appointment, civil or military, and be recommended by certain specified reporting officers as an officer suitable for trainee status. The number of trainees accepted is governed by Army requirements.

The *second stage* is that of clinical officer, a grade applicable to territorial Army and National Service officers and one which has been introduced to meet a temporary shortage of experienced specialists. A clinical officer is one whose knowledge and experience of a special subject are such that he can diagnose and treat the common ailments of the specialty occurring in a military population or can carry out the routine and uncomplicated procedures of the specialty. He is known as a clinical officer in anesthetics and so forth, and, whenever possible, works under the supervision of a specialist.

The clinical officer must be qualified 1 to 2 years, according to the subject, have had special training in his subject varying between 6 and 18 months, and have been recommended by certain specified authorities.

The *third stage* is the graded status and is applicable both to officers of the Regular Army and the Reserve Army. It is granted to those who are qualified to do specialized work but who are younger or less

experienced than specialists. They are available to fill vacancies in specialist appointments, when for any reason, a specialist is not immediately available.

To be accepted in a graded status an officer must be qualified at least 3 years, have minimum service of 1 to 3 years (depending on the subject) have had at least 2 years' training in his special subject, and be favorably reported on by various specified authorities.

And finally, the *fourth stage* is that of the specialist. He is defined as an officer who, by his qualifications and experience in a special branch of medicine, is recognized as an expert to whom patients suffering from conditions beyond the scope of general practice are sent for

Figure 1.—Medical entomology lecture in the lecture theater of the Royal Army Medical College.

diagnosis and treatment and to whom problems requiring special knowledge and technique are referred.

The R. A. M. C. specialist must have been qualified at least 7 years, spent at least 5 years in the practice of his special subject, have obtained the appropriate higher degree or diploma such as: Fellowship of the Royal College of Surgeons, membership of the Royal College of Physicians, the diploma in public health, the diploma in medical radiology, and so on, and be recommended by certain specified authorities as suitable for specialist status.

Specialist classification is the final professional stage and such officers are employed as practicing specialists up to and including the rank of lieutenant colonel. In ranks beyond lieutenant colonel there are appointments in the larger commands as deputy directors and as consultants in the rank of colonel and, at the War Office and Royal Army Medical College combined appointments as Director and Consultant in the rank of brigadier or major general. The Director of Medicine and Consultant Physician to the Army functions as a Director at the War Office but is held on the strength of the Royal Army Medical College as Consultant Physician to the Army at home and part-time teacher in tropical medicine.

The specialist subjects at present recognized are medicine, physical medicine, surgery, orthopedic surgery, pathology, Army health, malariology, entomology (fig. 1), physiology, psychiatry, venereology, dermatology, otorhinolaryngology, ophthalmology, radiology, anesthetics, and obstetrics. Extreme specialism is not required; pathology, for instance, covers bacteriology, serology, protozoology, virus diseases, and tissue pathology. Nor are the rules for qualification absolutely rigid; provision is made for special cases to receive individual consideration.

The main military center of professional training is the Royal Army Medical College at Millbank, London. Need for improving the postgraduate training of the Army medical officer was decided during the Crimean War and, in 1857, an Army Medical School was established in the military hospital at Fort Pitt, Chatham. Five years later the school was moved to Netley near Southampton. Here the school remained for 40 years and here many of the principles and teaching of military medicine were developed. The professors were either civilians or officers of the Medical Staff Corps (the R. A. M. C. was not formed until 1898) and the subjects taught were military hygiene, pathology, military surgery, and tropical medicine. In addition to teaching, the staff carried out a considerable amount of research in such subjects as typhoid immunization and the treatment of water supplies in the field. Netley proved a pleasant center but it was far removed from any of the large medical schools.

In 1902, the staff moved to London to inaugurate the Royal Army Medical College which, in 1907, occupied the newly completed Millbank buildings. In the headquarters mess at Millbank (fig. 2) is room for about 70 residents. Queen Alexandra's Military Hospital nearby provides teaching facilities in a selected group of military patients from all parts of the world and the London medical schools are available with their special courses for higher degrees. The four subjects taught at Netley, especially in their military application, were

continued and the principal courses conducted each year for officers numbered four. There were two junior courses for the lieutenants on probation for the R. A. M. C. and the Indian Medical Service and two senior courses for officers of about 10 years' service returned to the United Kingdom after their first tour of service abroad. An officer's promotion to major depended on successfully passing the examination at the end of the senior course. Officers suitable for training as specialists were selected from those who did well in the examinations.

Specialist training in military hygiene and pathology was given almost entirely in the laboratories of the Royal Army Medical College. Training in the other special subjects was arranged in one or other of the London medical schools. These activities were interrupted during

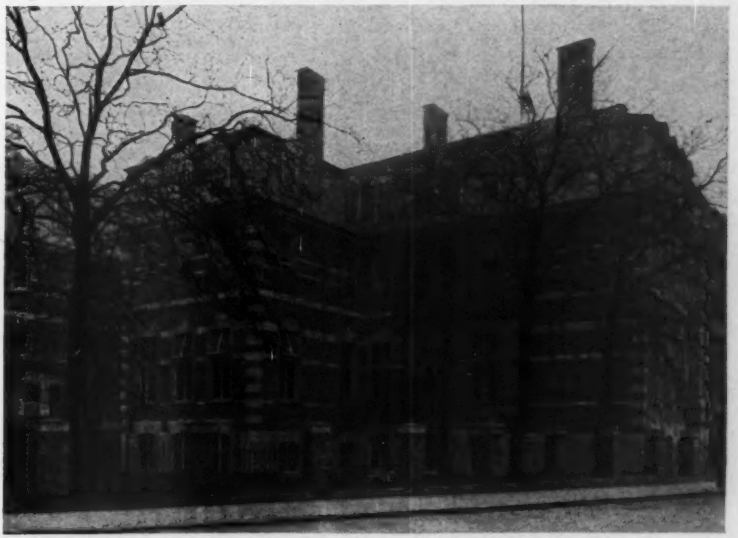

Figure 2.—Headquarters and Officers' Mess, Millbank, London.

two World Wars. Between 1939 and 1945, the teaching facilities of the Royal Army Medical College were devoted mainly to providing short courses in tropical medicine for young practitioners temporarily joining the R. A. M. C. with emergency commissions.

Since 1945 there have been further changes. Army psychiatry has been added to the subjects taught and the term "Army health" has replaced the term "military hygiene." The Director of Army Health is a full-time Director in the Army Medical Directorate (A. M. D.) of the War Office and there is a professor of Army health at the Royal Army Medical College. The other A. M. D. directors (of pathology,

medicine, surgery, and psychiatry) are held on the establishment of the college where they are also available as Army consultants and undertake a small part of the teaching. The bulk of the teaching at the college is the responsibility of readers with lieutenant colonel's rank and their assistant demonstrators.

The commandant of the college (a major general) is director of studies and is assisted by the college council of which he is chairman. In addition to the commandant and the five directors, the college council includes the Deputy Director General, Army Medical Services and this body is, in effect, responsible for advising the Director General on all matters concerning professional activities, research, and training in the R. A. M. C. It is the council which advises on the selection of officers for special training, the training courses most suitable for the individual officer, and the specialist status to which he has attained.

The old junior courses for lieutenants on probation have not been resumed since World War II. Young officers granted short-service Regular commissions are now recruited from the National Service intake of which there is one every 3 weeks. They do not join in bulk as they did formerly, every 6 months, to form a junior class. In partial place of this instruction, the officers of each National Service intake are given a short course of 3 days in tropical medicine.

The senior course has also changed in many ways—most notably in extension of the time allowed for specialist study which formerly was limited to about 6 months. The course is now taken by an officer of 8 or 10 years' service and commences with 2½ months' concentrated study in the subjects taught at the Royal Army Medical College. This is followed by a 2½-month refresher course in general clinical medicine in one of the London teaching hospitals. A written, practical, and oral examination is held at the end of each of these parts, the examiners being the directors and readers of the college staff assisted by appointed civilian examiners.

From those who show most promise in competing with this senior course and according to their previous experience and the requirements of the Army at the time, are selected officers whom the college council recommend for special training. This training may be for a period of up to 12 months arranged by the commandant. Some of it, especially in pathology and Army health, is undertaken by the Royal Army Medical College but most of it is arranged at civilian medical schools where special courses for higher degrees and diplomas are arranged. London provides most of the teaching but great latitude is allowed. If an officer wishes to go back to his old medical school, say in Edinburgh, Belfast, Durham, or Liverpool, this may be arranged provided the course proposed is suitable. It has been found

that extension of the time allowed for special training up to a maximum of 12 months allows any officer with sufficient background of experience to obtain the higher degrees and diplomas deemed necessary to support his specialist status.

Fees for the courses in civilian schools and entrance fees for examinations are paid by the Government in respect of all officers undertaking the specialist college course. Army pay and allowances are issuable during all courses.

This specialist training applies to officers holding a permanent Regular commission. Officers holding short-service Regular commissions who do not go on to permanent commissions, revert to the reserve on completion of 4 years full-time service before they are due for the senior course.

The War Department does not provide professional training for officers R. A. M. C. of the Territorial Army or of the Regular and Supplementary Reserves. These obtain their experiences on the staffs of the hospitals of the National Health Service and obtain their higher qualifications on their own initiative; but on these attainments they are classified by the college council as to their specialist status in the same way as Regular officers and are then available on mobilization or on embodiment of the Territorial Army to fill specialist appointments on the establishment of Army formations and units.

"Operation Portrex"

I. A Medical Officer on "Operation Portrex"

JOSEPH K. BAYNE, *Major, MC, U. S. A.*[1]

"CERTAINLY seems a waste of time to me. Here I leave 10 OB cases just about ready to pop, and then go off on a damn fool junket like this. Of course, a Caribbean cruise in March isn't too bad, but the Army is sure going to lose money on this deal. Hell! I'm a doctor—not a Boy Scout. Maybe you like to play these children's games, but as for me I'm strictly a hospital man!"

This was only a small part of the tirade leveled at me from Bob Matson,[2] a fellow physician. He had turned up, strangely enough, as one of my regimental surgeons. I had not seen him since we graduated together, 10 years ago. Both of us had joined the Army; he to follow a professional hospital career, and I one of command and staff work in the Medical Department. I observed that babies were nice but that I thought the Army should be able to fight a war if necessary and that the mission of the Medical Service was to keep the Army in condition to fight, take care of the wounded, and get them back to a hospital as rapidly as possible where they could receive definitive treatment.

"Well, I realize that has to be done, but any corporal can do that—or maybe a Pfc for that matter—certainly no need for a doctor to waste time on such elementary stuff as first aid, sanitation, and running a taxi service for simulated wounded. However, if they're foolish enough to give me a vacation, I'll just relax and enjoy it."

Bob's relaxation was short-lived for as is the custom with troop trains, the engineer did his best to tear the car apart or get it to leave the track as we rattled and banged our way from Fort Benning, Ga., to Charleston, S. C. There we embarked for Norfolk, Va., where we were to receive amphibious training and get our first real taste of "unification of the services." Many refinements in technique had been developed since the early war days. We were drilled carefully

[1] 3d Infantry Division.

[2] The name is fictitious, the conversation is not.

in the proper methods of ascending and descending "scramble nets." After seeing a few men freeze, refusing to move up or down, and after discovering that certain muscles had not been used in years, we realized the importance of this.

Boat teams were organized, each man having a definite job and place in the boat. Some held the bottom of the nets so that those descending would end up in the craft instead of the water, while others lowered heavy equipment by lines. We were impressed with the necessity of securing our personal gear so that it would not become entangled in the net or fall on those below, yet could be rapidly taken off if we should fall into the water. In addition to the general amphibious training, the medical troops received instruction in medical planning in amphibious warfare, medical supply in amphibious operations, medical service during debarkation and assault, and evacuation of casualties.

I did not see Bob Matson again until our second week of training. By that time he had exchanged his hospital pallor for a healthy coat of tan and looked physically fit. He said he felt 10 years younger, bet he could beat me climbing up a "scramble net," bragged that his boat team was the best, but admitted a slight amount of concern because the plans and operations officer had asked him to write the medical plan for the support of the regiment, and, "Well, frankly—just what the hell was that?" I mentioned something about asking the corporal or private first class to do it, but he did not seem to think it very amusing.

After reading the medical plan for the task force, he opened up with a barrage of questions, expressing concern over how he was going to provide medical care for 3,000 men when they were spread over 12 square miles. He had some doubts as to the ability of his aid men to take care of serious injuries and questioned whether patients would get back to the hospital ship when transportation was so short. He even expressed the opinion that if he were responsible for the medical support he would like to have time at least to find out the capabilities of his men and equipment. I suggested that that sounded suspiciously like a medical officer command. We worked out a medical plan for his regiment that seemed to cover anything. The necessity of medical officers having field experience was being impressed on him.

Our voyage south to the rendezvous was made under simulated wartime conditions. We were frequently under attack by submarines and aircraft. While primarily Navy training, the numerous alarms gave the troops some idea of what might be expected under combat conditions. It also gave us an opportunity to experiment with dramamine for the prevention of seasickness. This drug in doses of 100 mg., re-

peated at 3-hour intervals if necessary, produced excellent results. Tolerance was good and its effectiveness kept troop efficiency at a high level. In anticipation of possible rough waters during assault, it was directed that distribution of this drug would be made to company aid men, thus providing a supply in each landing craft.

On arrival off Vieques Island, which lies east of Puerto Rico in the Caribbean, high winds and heavy seas were encountered. The small landing craft rising and falling on the 10- to 15-foot waves, made descent of the nets slightly disconcerting. At times the boats would

Figure 1.—Third Infantry Division going down nets to landing craft for invasion of Vieques Island.

be dashed into the side of the vessel. Many craft needed extensive repairs by night fall. It was then that our thorough training produced results (fig. 1). Although several casualties occurred, some of which were serious, the number was surprisingly small considering the weather conditions. The presence of medical troops, particularly physicians, gave the men confidence. This is an extremely important factor in maintaining morale under hazardous conditions. The realization that they will be taken care of by a physician allays the fear of the troops. A layman, even though well trained, will not produce this result. One craft was engulfed and 35 men found themselves in the water struggling to remove their packs. Life preservers kept them afloat and eventually all were rescued.

Wave after wave of troops sped ashore, each accompanied by aid men. Initially, casualties were evacuated in the same boat that brought them ashore. Soon a beach evacuation station was set up. Here casualties were classified, treated, and evacuated to the hospital ship when necessary. As many as possible were returned to their unit. In such a station a physician is necessary. His judgment saves lives and also prevents the needless evacuation of men. He is instrumental in preserving the fighting strength of the line units.

The beaches with their bulldozers, cranes, trucks, growing piles of supplies and matériel presented a scene of great activity. There was a steady flow of men and equipment landing in what appeared to be confusion but passing over the beaches rapidly and disappearing inland; and coming back there was a flow of casualties, mostly simulated, but many actual. At times the aid stations were overtaxed with walking wounded and litter patients suffering from heat exhaustion, fractures, lacerations, burns, and a variety of conditions that a civilian physician would not see in years. My old classmate was evidently keeping busy. His regiment was having a rough time of it. Simulated casualties were heavy. His aid stations were moving frequently in support of the action. One was almost wiped out by artillery fire.

By the second day we had captured enough ground so that the evacuation hospital could be brought ashore. When set up this could take care of any type of patient and it would no longer be necessary to evacuate to the hospital ship. This evacuation hospital, commanded by a medical officer with considerable field experience, was opened expeditiously. By the end of the exercise, 251 actual and 715 simulated casualties had been processed by the various medical units. This was quite a record for 3½ days of action.

We spent several days in Martinique after the exercise was over. Here I saw my friend once more. Perhaps it was the tropic sun or maybe the effects of Martinique's famous liquid export. Certainly

it was something potent that led him to confess that there "evidently was a need for doctors in field units—it was rather interesting work—as a matter of fact he had a few ideas he'd like to try out, and after all, the primary mission of the Medical Service was to keep the Army in condition to ——." I refrain from making the obvious retort.

II. Medical Umpiring of Army Units

DONALD E. CARLE, *Colonel, MC, U. S. A.*

IN 1949, the Joint Chiefs of Staff directed the implementation of a Joint Puerto Rican Exercise for 1950. The resultant exercise, "Operation Portrex," a joint airborne-amphibious operation, was implemented to provide training in the planning and execution of joint operations, to test new equipment and technics, and to evaluate the state of readiness. A chief umpire was designated for the maneuver, and a chief umpire from each of the three services were designated as his deputies. Over 1,800 men of the Army, Navy, Marine Corps, and Air Force were specially trained as umpires. Twenty-nine officers of the Army Medical Service umpired the Army medical units of both the Aggressor Force and the Invasion Force. These umpires had, for the most part, little or no previous experience in umpiring and consisted largely of Reserve component Medical Service officers. This number made possible a definitive and all inclusive

Figure 1.—Exterior of aggressor aid station established in Operation Portrex.

umpire coverage of the Army medical units participating. Each battalion aid station (figs. 1 and 2) and regimental collecting station was assigned a separate medical umpire, as was each separate medical unit and each company within the divisional medical battalion. In addition, one Navy medical officer was assigned as Navy medical liaison officer with the Army Umpire Group.

UMPIRE TRAINING

An umpire school was conducted for all ground umpires at Headquarters, Army Umpire Group, Camp Lee, Va., to prepare the umpires to carry out their assignments with optimal proficiency. The initial phases of the instruction covered basic orientation concerning organization and employment of the arms and services organic to an infantry division, indoctrination concerning the Aggressor concept, and a re-

Figure 2.—Interior of aggressor aid station established in Operation Portrex.

view of the umpire manual and general umpiring principles. A great deal of instruction was given in signal communications and familiarization with the signal equipment to be used by umpires in the proposed operation. Later, the umpires were given ship-to-shore amphibious training at Little Creek, Va., followed by a trip to Langley Field, Va., where various aircraft and their capabilities were demonstrated. The terminal portion of the umpire training was devoted to a command post exercise, and separate conferences on specific medical check lists to be used in the actual operation. All umpires were then transported

to Vieques Island where a base camp for the Army Umpire Group had been established. While there, an on-the-ground terrain study was made of the maneuver ground, including a detailed study of possible landing beaches. A series of field problems were conducted on the actual maneuver terrain, initially, without troops and later with participating troops of the Aggressor Force, prior to the actual maneuver.

The umpires designated to umpire units of the Joint Task Force were then transported by air back to Norfolk where they joined their respective units. This arrangement allowed for on-the-ground reconnaissance of the maneuver area prior to the operation, better familiarization with the personnel, equipment, and plans of the Aggressor Force, and yet enabled the umpires to observe the actions of the Joint Task Force troops from embarkation to actual beach landings and the maneuver proper.

UMPIRE OPERATIONAL PLANS

The general maneuver plan was based on the following assumption: The United States and an enemy nation known as Aggressor were at war. The island of Vieques represented an area of a large theoretical continent and was held by Aggressor troops in garrison after being heavily fortified with well-prepared defensive positions. The Aggressor Forces were in possession of short-range tactical aircraft and submarine forces. The Vieques area was designated by the United States for seizure through amphibious and airborne means, in order to develop a base for a future strategic air operation. It was further indicated that the amphibious operation would be launched from the continental United States and the airborne operation from friendly territory in the Vieques area. The entire operation was to include major land, sea, and air operations.

In the operation, assessment of casualties was carried out by the unit umpires. Medical umpires only assessed casualties occurring in personnel within the specific medical unit being umpired. Casualties were assessed appropriate to the action, with every effort made to promote and further realism. Casualties so assessed were tagged with one of three types of tags: (*a*) a red tag for seriously wounded casualties, (*b*) a green tag for slightly wounded walking casualties, and (*c*) a white tag for those dead as a result of the specific action. A definite appropriate diagnosis appeared on the tag, calculated to necessitate certain specific first-aid and medical treatment procedures on the part of those medical personnel manning the various medical installations. Also, specific instructions to the assumed casualty were on the tag, governing what physical actions, if any, he might take

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after being tagged. In order to provide the maximum training to all units and to permit maximum employment of all personnel, the assessed casualties were, on the completion of appropriate medical processing, readmitted to the play of the maneuver as replacements or additional support groups.

The medical umpiring of Operation Portrex was highly successful and was carried out in an efficient manner. Its success was, in a large measure, due to the fine cooperative spirit exhibited by the medical umpires participating in the maneuver, many of whom had no previous experience in umpiring but who willingly and wholeheartedly participated in the preparatory instruction and carried out their duties in the actual maneuver with unflagging interest and zeal.

About the Army Medical Service

Medical Service Civilian Consultant Program, Fiscal Year 1951

RALPH J. RICHARDS, JR., *Major, MSC, U. S. A.*[1]

IN THE past 5 years the Army Medical Service has made extensive use of outstanding civilian physicians, dentists, and other related specialists as professional consultants. These consultants have been used in many activities and have materially contributed in bringing the Army Medical Service to the position it enjoys today. These consultants have been used: (*a*) to maintain contact with the leaders in civilian medicine; (*b*) to maintain accreditation of the Medical Service's professional training programs and "practice time phase" with the various specialty boards; (*c*) to advise in the care of patients; (*d*) to provide the latest information, most recent teachings, and fresh viewpoints to Army physicians serving overseas; and (*e*) to participate as instructors in special programs of the Medical Service.

Until the fiscal year 1950 the employment of civilian consultants was not restricted by a limitation of funds for their payment. Both the Department of the Army and Congress recognized that, in view of the critical shortage of medical specialists, every effort had to be exerted to assure adequate medical care to members of the military service. In view of the economic efforts that were initiated by the President and the fact that the Medical Service had either procured or trained a large number of professionally qualified officers, an evaluation of the consultant program was made. The object of this evaluation was to determine the minimum number of consultant man-days that would be required by the Medical Service in the fiscal year 1951.

In conducting this evaluation, the factors given primary consideration were: (*a*) the actual number of consultant man-days that were used by each command in the period 1 July 1949 to 30 April 1950; (*b*) the number of consultant man-days by specialty that were recommended for the fiscal year 1951 either by the using command or by a representative of the Office of the Surgeon General who surveyed

[1] Personnel Division, Office of the Surgeon General, Department of the Army.

certain organizations; and (*c*) the number of board-certified and board-qualified officers that would be available to each using command in the succeeding fiscal year. It was believed that by carefully evaluating each of these elements, the requirement of and the authorization to each command would be equitably resolved.

This action has been completed and each using command has been advised of its authorization. In general, the civilian consultant program for the fiscal year 1951 has been designed to effect a reduction of about $250,000 below the amount expended in the fiscal year 1950. Concurrent with the aforementioned study, efforts were made to determine a method by which all using commands could be made responsible for the appointment and reimbursement of their respective consultants. These efforts are in keeping with the decentralization directive of the Chief of Staff. It has been determined that such a decentralization will be effected on or about 1 January 1951 so as to give this authority to continental Army commanders, the Commandant, United States Military Academy, and the commanders of Tripler and Rodriguez Army Hospitals. At present such authority is exercised only by the commanding officers of the named Army hospitals in the continental United States. Specific instructions will be issued when appropriate.

As a result of this evaluation it may be concluded that the Medical Service will continue to implement its civilian professional consultant program in the most economical manner that will assure the desired results.

BOOKS RECEIVED

SIMPLIFIED CHEMISTRY EXPERIMENTS, by Armand Joseph Courchaine, *Instructor in Biological Chemistry, Hahnemann Medical College, Philadelphia, Pa.; Science Instructor, Hahnemann Hospital School of Nursing, Philadelphia, Pa.; formerly Laboratory Supervisor, Human Serum Albumin Department, Sharp & Dohme, Incorporated, Glenolden, Pa.; formerly Analytical Chemist, The Barrett Division, Allied Chemical & Dye Corporation, Philadelphia, Pa.* Edited by M. Cordelia Cowan, illustrated by Richard Albany. 234 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1950. Price $2.80.

A TEXTBOOK OF ORTHODONTIA, by Robert H. W. Strang, M. D., D. D. S., *Director of courses in orthodontia in the extension teaching departments of Columbia University and the University of Toronto; Director of the Fones School of Dental Hygiene, University of Bridgeport; Co-editor of "The Angle Orthodontist"; Consulting Oral Surgeon to the Bridgeport Hospital, Bridgeport, Conn.* 3d edition. 825 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $15.

A TEXTBOOK OF PSYCHIATRY for Students and Practitioners, by Sir David Henderson, M. D. (Edin.), F. R. F. P. S. (Glas.), F. R. C. P. (Ed. and Lon.); *Physician-Superintendent of the Royal Edinburgh Hospital for Mental Disorders, and Professor of Psychiatry, University of Edinburgh,* and the late R. D. Gillespie. 7th edition. 740 pages. Oxford University Press, New York, N. Y., publishers, 1950. Price $7.75.

ANNUAL REPRINT OF THE REPORTS OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION, with the comments that have appeared in the Journal of the American Medical Association, 1949. 231 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $2.

TYPES OF DIABETES MELLITUS AND THEIR TREATMENT, by Arthur R. Colwell, M. D., *Associate Professor of Medicine and Director of Medical Specialty Training, Northwestern University Medical School; Attending Physician, Evanston Hospital; Consulting Physician, Wesley Memorial Hospital, Municipal Tuberculosis Sanitarium, Chicago, Ill.* Publication Number 67, American Lecture Series. 97 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.25.

THE PHYSIOLOGICAL BASIS FOR OXYGEN THERAPY, by Julius H. Comroe, Jr., *Professor of Physiology and Pharmacology, Graduate School of Medicine, University of Pennsylvania; Clinical Physiologist, Hospital of the University of Pennsylvania;* and Robert D. Dripps, *Professor of Anesthesiology, University of Pennsylvania School of Medicine. Director of Anesthesiology, Hospital of the University of Pennsylvania.* Publication Number 42, American Lecture Series. 85 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $2.

MALIGNANT DISEASE AND ITS TREATMENT BY RADIUM, by Sir Stanford Cade, K. B. E., F. R. C. S., M. R. C. P., *Surgeon, Westminster Hospital; Consulting Surgeon, Mount Vernon Hospital and Radium Institute; Lecturer in Surgery, Westminster Medical School and formerly Examiner in Surgery, University of London; Member of the Council and of the Court of Examiners, late Hunterian Professor and Arris and Gale Lecturer, Royal College of Surgeons of England; Hon. Member American Radium Society; Consultant in Surgery to the Royal Air Force,* with a foreword by Sir Ernest Rock Carling, F. R. C. P., F. R. C. S., F. F. R., *Consulting Surgeon and Vice-President, Westminster Hospital.* Volume III. 2d edition. 446 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price $12.50.

PYE'S SURGICAL HANDICRAFT, A Manual of Surgical Manipulations, Minor Surgery, and Other Matters Connected With the Work of Surgical Dressers, House Surgeons and Practitioners, edited by Hamilton Bailey, F. R. C. S. Eng., *Surgeon, and Surgeon-in-charge of the Genito-urinary Department, Royal Northern Hospital, London;*

Senior Surgeon, St. Vincent's Clinic and the Italian Hospital; Surgeon, Consolation Hospital, Lambeth; General Surgeon, Metropolitan Ear, Nose, and Throat Hospital, London; Consulting Surgeon, County Hospital, Chatham, Potter's Bar Hospital, and Clacton Hospital; formerly External Examiner in Surgery, University of Bristol. 16th edition, fully revised. 724 pages with 830 illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price $6.

GERMAN AVIATION MEDICINE, WORLD WAR II, Volumes I and II. Prepared under auspices of The Surgeon General, U. S. Air Force, Department of the Air Force. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price $8.50 for volumes I and II (must be purchased in sets).

NUTRITION IN HEALTH AND DISEASE, by Lenna F. Cooper, B. S., M. A., M. H. E., Sc. D., *Consultant Dietitian and Formerly Chief of the Department of Nutrition, Montefiore Hospital, New York City; Formerly Food Director, University of Michigan; Dean of School of Home Economics, Battle Creek College; Supervising Dietitian, U. S. Army, World War I; President, American Dietetic Association, 1937–1938;* Edith M. Barber, B. S., M. S., *Writer and Consultant, Food and Nutrition; Food Editor, General Features Syndicate; Formerly Food Editor, New York Sun; Lecturer on History of Cookery and Public Relations for Home Economists, Teachers College, Columbia University;* and Helen S. Mitchell, A. B., Ph. D., *Dean of the School of Home Economics, University of Massachusetts; formerly Principal Nutritionist, Office of Defense, Health and Welfare Services; Professor of Physiology and Nutrition, Battle Creek College.* Associate Author Henderika J. Rynbergen, B. S., M. S., *Assistant Professor of Science, Cornell University-New York Hospital School of Nursing; formerly Director of Dietetics, American University Hospital, Beirut, Lebanon; Food Clinic Dietitian, Vanderbilt Clinic, Presbyterian Hospital, New York; Food Clinic Dietitian, Barnes Hospital, St. Louis; Nutritionist, Community Health Association, Boston.* 11th edition, revised and reset. 744 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price $4.

THE PATHOLOGY OF INTERNAL DISEASES, by William Boyd, M. D., Dipl. Psych., M. R. C. P. (Edin.), F. R. C. P. (Lond.), F. R. C. S. (Canada), LL. D. (Sask.), D. Sc. (Man.), M. D. (Oslo), F. R. S. (Canada); *Professor of Pathology and Bacteriology in the University of Toronto, Toronto.* 5th edition, thoroughly revised. 866 pages, with 391 illustrations and 11 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $11.

THE MASK OF SANITY, An Attempt to Clarify Some Issues About the So-Called Psychopathic Personality, by Hervey Cleckley, M. D., *Professor of Psychiatry and Neurology, University of Georgia School of Medicine, Augusta, Georgia.* 2d edition. 569 pages. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $6.50.

WILLIAMS' OBSTETRICS, by Nicholson J. Eastman, *Professor of Obstetrics, Johns Hopkins University, and Obstetrician-in-Chief to the Johns Hopkins Hospital.* 10th edition. 1,176 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1950. Price $12.50.

NURSING IN PREVENTION AND CONTROL OF TUBERCULOSIS, by H. W. Hetherington, M. D., M. R. C. P. (London), *Chief of Clinic of the Henry Phipps Institute of the University of Pennsylvania; Assistant Professor of Medicine of the University of Pennsylvania School of Medicine; Former Visiting Physician to the White Haven Sanatorium;* and Fannie W. Eshleman, R. N., B. S., *Supervisor of Public Health Nursing of the Henry Phipps Institute of the University of Pennsylvania; Lecturer on Tuberculosis Nursing, Department of Nursing Education of the University of Pennsylvania.* Revised 3d edition. 361 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1950. Price $4.50.

PHYSICIAN'S HANDBOOK, by Marcus A. Krupp, M. D., *Assistant Clinical Professor of Medicine, Stanford University School of Medicine; Director, Clinical Pathology, Veterans' Administration Hospital, San Francisco;* Norman J. Sweet, M. D., *Assistant Professor of Medicine, University of California School of Medicine, San Francisco;* Ernest Jawetz, Ph. D., M. D., *Associate Professor of Bacteriology and Lecturer in Medicine and Pediatrics, University of California School of Medicine, San Francisco;* and Charles D. Armstrong, M. D., *Clinical Instructor in Medicine, Stanford University School of Medicine.* 6th edition. 380 pages. University Medical Publishers, Palo Alto, Calif., publishers, 1950. Price $2.50.

BOOK REVIEWS

A TEXT-BOOK OF PSYCHIATRY for Students and Practitioners, by Sir David Henderson, M. D. (Edin.), F. R. F. P. S. (Glas.), F. R. C. P. (Ed. and Lon.); *Physician-Superintendent of the Royal Edinburgh Hospital for Mental Disorders, and Professor of Psychiatry, University of Edinburgh*, and the late R. D. Gillespie. 7th edition. 740 pages. Oxford University Press, New York, N. Y., publishers, 1950. Price $7.75.

This is the seventh edition of a well-known textbook of psychiatry. Comparison with earlier editions indicates that most of the revising consists of additions either at the beginning or the end of chapters with the main body of material remaining practically unchanged. This introduces an element of confusion in that the older portions conflict with the more recent. The author had adopted a very conservative attitude toward the theoretical aspects of psychiatric thinking and while declaring himself to be an adherent of Dr. Adolph Meyers, he has presented an eclectic viewpoint with little or no emphasis on Meyerian doctrines. While this is commendable from the viewpoint of giving the student a wide variety of choice, it is somewhat misleading. Other examples of conservatism are especially noted in the portions of chapters devoted to the treatment of various conditions. Bromides, for example, are stated to be "the sheet-anchor of treatment, with a useful accessory in luminal."

The practice of placing historical data at the beginning of many chapters is a good one. The student learns history as well as psychiatry in the process. Also the inclusion of references within the text material facilitates reading without the necessity of referring to a voluminous bibliography. This book has value as a reference text for a psychiatric resident, especially since it presents a conservative, comprehensive view of past and present trends in psychiatry. For a general practitioner, it affords a fairly redundant reference book for the understanding of psychiatric problems in his practice.—*Lt. Col. H. E. Wilkinson, MC, U. S. A.*

TREATMENT IN PSYCHIATRY, by Oskar Diethelm, M. D., *Professor of Psychiatry, Cornell University Medical College; Psychiatrist-in-Chief, The New York Hospital (Payne Whitney Psychiatric Clinic)*. 2d edition. 574 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $8.50.

This, the second edition of an important textbook on treatment in psychiatry, has undergone extensive revision. While many of the changes have been aimed at making the presentation more simple, direct, and readable, much new material has been included. The patient as a dynamic unit holds a prominent place throughout the text. The general plan of the book—the first seven chapters being devoted to principles and methods of treatment, and the remaining chapters to the treatment of specific reaction patterns—is considered good for students and the general practitioners who want to orient themselves in psychiatry. A new chapter on the therapeutic action of various physical and chemical agents has been included. The basic constructive approach which gives the reader the feeling that something can be done to better the lot of even the sickest patient

is most welcome. The authoritative role given the therapist throughout the part of the book dealing with treatment of specific reaction patterns, although useful in some situations, may in itself place undesirable limits on therapy with many patients. This is especially true with children. It was disappointing to find the primary therapeutic recommendation in emotionally disturbed children was "placement in a foster family or boarding school."—*Commander M. E. Roudebush (MC) U. S. N.*

PENICILLIN AND STREPTOMYCIN IN THE TREATMENT OF INFECTIONS, by Chester S. Keefer, M. S., M. D. Sc. D. (Hon.), *Wade Professor of Medicine, Boston University School of Medicine; Director of Evans Memorial and Physician-in-Chief, Massachusetts Memorial Hospital, Boston; Chairman, Committee on Chemotherapeutic and Other Agents, National Research Council; Consultant to the Committee on Medical Research, Office of Scientific Research and Development, Washington, D. C.*, and Donald G. Anderson, M. D., *Instructor in Medicine, Boston University School of Medicine; Research Fellow in Medicine at Evans Memorial; Assistant Visiting Physician, Massachusetts Memorial Hospital, Boston, Mass.*, edited by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), M. A. C. P., Hon. F. R. C. P. (Can.), D. S. M. (A. M. A.), *Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts Medical School; Sometime Physician-in-Chief, Carney Hospital; Sometime Visiting Physician, Beth Israel Hospital; Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital, Boston, Mass.* (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work). 111 pages. Oxford University Press, New York, N. Y., publishers, 1950. Price $2.50.

Here, two sections from the Oxford Loose-leaf Medicine are separately bound and offered as a book. The same plates were used so the pages bear their original numbers from the larger work. The section on penicillin consists of 47 pages of text and 18 pages of bibliography which is classified under various subtitles. The section on streptomycin contains 30 pages of text and 12 pages of bibliography similarly classified. The emphasis is on treatment. The text has been condensed until there seems to be hardly a single superfluous word. For the busy general practitioner who desires the latest authoritative word on these drugs, this is the book. It has an index.—*Commander H. J. Alvis (MC) U. S. N.*

A PRIMER OF VENOUS PRESSURE, by George E. Burch, M. D., *Henderson Professor of Medicine, Tulane University School of Medicine; Senior Visiting Physician, Charity Hospital; Consultant in Cardiovascular Diseases, Ochsner Clinic; Visiting Physician, Touro Infirmary, New Orleans.* 174 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publisher, 1950. Price $4.

Few subjects in medicine have received more attention in recent years than the cardiovascular system. Early in this study particular interest was directed toward the heart, and recently the peripheral circulation has been the source of much investigation. The venous system has lagged behind and this book calls attention to the importance of experimental and clinical investigation in this area. The book is primarily concerned with fundamentals but includes a practical discussion of bedside technics of venous pressure measurement. The author makes no claim to an exhaustive treatise on the subject of venous pressure but has brought a neglected subject to the attention of medical students and clinicians. Officers in the field will find the discussion of arteriovenous aneurysm of

interest. There is no bibliography. The illustrations, binding, and index are excellent.—*Lt. (jg) D. B. Carmichael, Jr. (MC) U. S. N.*

A SHORT HISTORY OF PHYSIOLOGY, by Kenneth J. Franklin, D. M., F. R. C. P., *Professor of Physiology at the Medical College of St. Bartholomew's Hospital.* 2d edition. 147 pages; illustrated. Staples Press, New York, N. Y., publishers, 1950. Price $2.

This concise volume condenses the history of physiologic endeavor up to the beginning of the twentieth century. Covering such a wide period, it hardly does more than catalogue names and events. This is done by centuries and by organ systems, however, and with the coherence and readability that characterize so many British authors. Da Vinci, Fernel, and Vesalius are treated, deservedly, in separate chapters, and Harvey is dealt with in great detail. Professor Franklin believes: "* * * it would be invidious for me, as a practicing physiologist, publicly to assess the work of others still alive." Still, it is unfortunate that the events of this century are omitted entirely. For the serious student this book would make an excellent reference text leading to further detailed reading, and at the same time would serve as a valuable orientative work for the more casual historian of physiology and medicine.—*Lt. R. K. Moxon (MC) U. S. N.*

THE PRACTICE OF MEDICINE, by Jonathan Campbell Meakins, C. B. E., M. D., LL. D., D. Sc., *formerly Professor of Medicine and Director of the Department of Medicine, McGill University; formerly Physician-in-Chief, Royal Victoria Hospital, Montreal; formerly Professor of Therapeutics and Clinical Medicine, University of Edinburgh; Fellow of the Royal Society of Edinburgh; Fellow of the Royal Society of Canada; Fellow of the Royal College of Physicians, London; Fellow of the Royal College of Physicians, Edinburgh; Honorary Fellow of the Royal College of Surgeons, Edinburgh; Fellow of the Royal College of Physicians, Canada; Fellow of the American College of Physicians; Honorary Fellow of the Royal Society of Medicine.* 5th edition. 1,558 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price $13.50.

This attractive fundamental textbook of medicine has undergone four revisions since 1936. It begins with an introductory chapter to the practice of medicine, usually missing or meager in similar modern texts, and then successively considers each system, except the skin and organs of special sense. All of the subjects are presented by Dr. Meakins except for the sections concerned with diseases of metabolism, the endocrine, urinary, and nervous systems, and the chapter on psychosomatic medicine. Few internists today would undertake such an enormous task of single authorship and the success of this volume is a tribute to the wealth of experience, breadth of vision, and proficiency of literary expression of the author. The 518 photographs and diagrams, of which 50 are in color, are an outstanding feature. Since the fourth edition, published in 1944, about 100 pages and 2 color plates have been added. Two new and excellent chapters, one on psychosomatic medicine by Dr. Hanson and the other on chemotherapy and antibiotics, are the major additions. The former constitutes a distinct advance as there is nothing to compare with it in any other current general book on medicine. Dr. Mason has revised the excellent chapter on diseases of metabolism and has collaborated with Dr. Hoffman in rewriting the section on diseases of the ductless glands. Dr. Schriver's division on diseases of the urinary system has also been brought up to date and includes a discussion of lower nephron nephrosis. The large section on neurology by Dr. Petersen

has few changes other than those necessitated by chemotherapeutic and antibiotic agents. This section remains a classic in textbooks of medicine.

Circulatory diseases are well covered. The introductory considerations of dyspnea, the pulse, pericardial pain, edema, and circulatory failure are outstanding and such a discussion is lacking in many other texts. Perhaps in a future edition Dr. Meakins can find space for a concise treatise of electrocardiography as this field is now so elaborate that it warrants particular consideration. The diseases of the hemopoietic system are presented with 27 illustrations of which two-thirds are colored plates. The gastroenterologic section is largely unchanged. Unfortunately, the division on hepatic disorders now appears deficient in its consideration of liver function tests and needs a discussion on the differential diagnosis of jaundice.

The chapter on respiratory diseases contains a discussion of cyanosis, poisoning by "war" and suffocative gases, and an unusually good presentation of emphysema. A more complete presentation of aerosol therapy and of primary atypical pneumonia and its complications, particularly pericarditis would be desirable. There are also excellent chapters on allergy and diseases caused by chemicals, drugs, and abnormal environments. This text departs from the usual presentation of infectious diseases in a manner pleasing to all but those who use a book for rapid reference, for many of the infectious diseases are discussed with the system with which they are clinically most often associated. Thus, the chapter on infectious diseases does not appear to be as formidable as is generally the case in textbooks.

Large volumes by multiple authors usually contain more factual detail than is found in books of single authorship. Although such criticism may apply in some degree, this present edition is one of the two most modern and complete textbooks on internal medicine available today. It is well organized, clearly printed, and written by an outstanding physician who, as Dr. Christian stated when writing of single authorship, "presents the various subjects of the text with a unity of critical thought as is not possible with multiple authorship."—*Lt. Comdr. H. R. Cooper (MC) U. S. N.*

ADMINISTRATION OF SCHOOLS OF NURSING, by Dorothy Rogers Williams, M. A., R. N., *Lecturer, Administration of Schools of Nursing and Nursing Services, Frances Payne Bolton School of Nursing, Western Reserve University; Executive Secretary, Association of Collegiate Schools of Nursing;* edited by Isabel M. Stewart, M. A., R. N., *Professor Emeritus of Nursing Education, Teachers College, Columbia University.* 288 pages. The Macmillan Company, New York, N. Y., publishers, 1950. Price $4.

Mrs. Williams has presented a clear, concise and informative text on the administrative phase of the nursing profession. She is one of the first to give to the profession a text for which there has long been a need. The trained administrator is a vital necessity in nursing if nursing is to be granted a place in the professional field, for in any type of business or line of work there must be leaders to guide and direct. This text emphasizes the fact that to set up schools to train adequate personnel the profession has a definite need for capable and qualified administrators who are able to cope with the rapid changes taking place in nursing practice. The various types of schools of nursing, the qualifications of the faculty, and the selection of students is thoroughly discussed. To those in the administrative field of nursing and to those who are interested in qualifying for such a position this book will be of great value. The information is well correlated, interesting, and easy to follow.—*Lt. Comdr. M. Terrill (NC) U. S. N.*

OCCUPATIONAL THERAPY, Principles and Practice, edited by William Rush Dunton, Jr., M. D., *Founder and Former Editor, Occupational Therapy and Rehabilitation*, and Sidney Licht, M. D., *Editor, Occupational Therapy and Rehabilitation*. 321 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $6.

Intended primarily as an aid for the physician in prescribing occupational therapy, this outstanding survey of all the major and allied phases of occupational therapy will also serve as an invaluable source of information for the occupational therapist, nurse, social worker, teacher, or librarian engaged in hospital work. Since each chapter deals with a different phase of this fast-growing profession, this competently edited book contains many contributions by authorities on the various subjects. Here are discussed, by specialists in the profession, the most accepted and advocated methods of treatment for the patient in relation to psychiatric illnesses, kinetic disorders and limitations, amputations, heart diseases, cerebral palsy, and tuberculosis.

Not only are the specific concerns of occupational therapy thoroughly analyzed, but also are the allied aspects of the professor clearly elucidated. The chapters, Bibliography in Neuropsychiatry, Recreational Therapy, and Drama Therapy, effectively demonstrate the necessity for a well-organized program in both general and special hospitals. Because the fundamental purpose of occupational therapy is to enhance the patient's recovery, these related aspects cannot be overlooked.

Although occupational therapy is being more widely utilized in all hospitals today, it is not a new form of treatment, for it has been used most successfully in many mental hospitals for years. Since World War II occupational therapy has been recognized as a necessary adjunct in the treatment of many illnesses and injuries. This book offers many striking examples of the important role occupational therapy plays in the treatment of patients. However, like all other efficacious medical procedures, treatments in occupational therapy must be executed by well qualified, proficient therapists.—*Lt. V. M. Bulshefski (NC) U. S. N.*

BRUCELLOSIS (Undulant Fever), Clinical and Subclinical, by Harold J. Harris, M. D., F. A. C. P., with the assistance of Blanche L. Stevenson, R. N. Foreword by Walter M. Simpson, M. S., M. D., F. A. C. P. 2d edition, revised and enlarged. 617 pages; 111 illustrations, 12 in full color. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price $10.

This is the revised and enlarged second edition of the monograph published first in 1941. Based on personal observations of about 700 patients and enlarged by the detailed examination of a bibliography of 742 cited references it stands as a monument to the author's devotion to the subject. He deserves the grateful appreciation of the profession for having brought together this orderly, inclusive, and clear presentation of the pertinent facts from the voluminous and often confusing literature on this widespread disease. The emphasis of this book is on impressing the profession with the fact that brucellosis is not a self-limiting disease of the rural areas devoid of local complications. The case is well made that it should be constantly in the mind of every physician, along with syphilis and tuberculosis, as a disease of great mimicry.

The organization and presentation of the text makes it a delight to read. Quotations from references, case histories, illustrations, and pithy personal comment are combined in such proportions that the reader is constantly led forward. It is clearly demonstrated that specialists in all fields as well as the general practitioner must be alert to recognize this disease. It is certain that at times the diagnosis will tax the capacities of the most expert with all facilities

at hand, and yet the possibility of brucellosis must constantly be in the minds of those who practice in remote areas. The symptoms are treated both in general and by regions. This latter approach makes it clear why this book is important to many specialists. The problems of diagnosis are described individually and then considered in their interrelationship. Laboratory methods are described sufficiently to make them understandable and references are available for the technical details. There is an excellent condensed section on differential diagnosis. The chapter on treatment takes up one by one the various proposals that have been made in recent years and points out their successes and shortcomings. This section is up to the minute in that recent additions to the antibiotics are considered. The various biologic preparations are given appropriate recognition. Unique and particularly interesting is the chapter on psychologic studies appearing first in this edition. Here the psychosomatic aspect of the disease is presented in a way that holds one's attention. Thoroughly adequate chapters on the epidemiology and prophylaxis of brucellosis are included.

One often reads of this or that book as being indispensable in the physician's library. If such a collection exists this book will surely find its place there. Specialists or general practitioners, in urban or rural areas, will profit by reading this book. It may well become one of the American medical classics.—*Commander H. J. Alvis (MC) U. S. N.*

AMPUTATION PROSTHETIC SERVICE, by Earle H. Daniel, *Director of Prosthetic Service, Institute of Physical Medicine and Rehabilitation, New York University, Bellevue Medical Center. Prosthetic Consultant to: Bellevue, City, Goldwater Memorial, Metropolitan, and University Hospitals, New York, N. Y.*, with foreword by Howard A. Rusk, M. D., *Professor and Chairman of the Department of Physical Medicine and Rehabilitation, New York University College of Medicine; Director, Institute of Physical Medicine and Rehabilitation, New York University, Bellevue Medical Center.* 327 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price $7.

This text should be of great value and interest to anyone associated with amputees, as it presents much valuable information as to types and construction of prostheses. It is written from the prosthetic makers point of view, yet by one who is well versed in the necessity of coordinating the efforts of the many skilled and professional persons who work with the amputee. The author presents answers to many problems that confront the surgeon in prescribing the proper prosthesis for his amputee patient and in training him in its use. He also presents in detail the many factors in proper fitting and construction of artificial limbs and includes a valuable Buyer's Guide for purchase of materials, a List of Certified Limb and Brace Makers, a Selected List of Motion Pictures on Rehabilitation and Physical Medicine, and a Glossary of Prosthetic Terms. The numerous illustrations aid greatly in the presentation of the subject which often is primarily technical in relation to the construction of prostheses. A wealth of practical information as to the proper fitting of artificial limbs, the correct type of limb, preparation of the stump, and training use of the limb is included. I believe that every surgeon who performs amputations as well as those who take part in the rehabilitation of amputees, such as the specialist in physical medicine and rehabilitation, the physical therapist, and the prosthetic makers should be acquainted with this book.—*Commander J. S. Thiemeyer, Jr. (MC) U. S. N.*

NEW DISCOVERIES IN MEDICINE, Their Effect on the Public Health, by Paul R. Hawley. 134 pages; illustrated. Columbia University Press, New York, N.Y., publishers, 1950. Price $2.50.

The material presented in this volume is a compilation of a series of Bampton lectures delivered by the author. They were designed for presentation to a lay audience and much of the content is not challenging to the physician. Four topics were considered: blood, operations on the heart and lungs, prevention and treatment of mental disease, and the socioeconomic aspects of medical care.

Except for minor considerations the picture presented to the nonprofessional person is clear and valid. The discussion of the relationship of the Rh factor to pregnancy seems unnecessarily threatening, and the complexities of cardiac operations force the author into extremely superficial treatment of this subject. In the area of medical economics, however, both the layman and the physician will find a stimulating discussion. It is in this field that Dr. Hawley has spent many years and here he has made an outstanding contribution. Although many will find his viewpoint unilateral, few will find a better statement of the problems which confront those who would alter the present free-enterprise system. As the pros and cons of "socialized medicine" continue to be weighed, it seems mandatory that physicians, as protagonists in the controversy, should be fortified with all possible facts and mature opinions. The author of this book has contributed both, and his conclusions merit attention.—*Lt. (jg) D. B. Carmichael, Jr. (MC) U. S. N.*

A TEXTBOOK OF ORAL HYGIENE AND PREVENTIVE DENTISTRY, by Russell W. Bunting, D.D. Sc., *Professor of Dentistry and Dean of the School of Dentistry, University of Michigan*, and collaborators. 240 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $5.

Professor Bunting opens the text with a definition of oral hygiene and closes it with a discussion of the present status of the modern dental hygienist. In the chapters between, he and a group of well-known collaborators have concisely presented the subject of preventive dentistry, including descriptions of the more commonly seen pathologic disturbances, their cause, and methods for their control. The 240 black-and-white illustrations and a color plate add to the value of this book which should fulfill the need for a one-text reference on basic science principles for the dental hygienist.

Kerr provides a chapter on the histology of oral structures which includes a chronology of human dentition.

In another chapter he discusses the role of traumatic occlusion in oral disease and describes a technique for the equilibration of occlusion. Bunting discusses the physiologic function of the mouth and its part in the human economy. He also devotes a chapter to accretions on teeth, including extrinsic and intrinsic stains. Jay offers a chapter on the history of caries research. Robinson discusses periodontal disease and includes an admirable one-page classification of cause, pathologic changes, and symptoms. Burket provides a chapter on stomatitis. Hard's chapter on oral prophylaxis includes a description of a technique for the operator, a patient's toothbrushing technique, and a discussion of dentifrices. Kahn discusses the modern concept of the role of dental foci in systemic disease, and Wisan reviews the status of dentistry in public health.

The format, binding, and paper are excellent and the illustrations are well reproduced.—*Maj. J. E. Chipps, DC, U. S. A.*

SUPERVOLTAGE ROENTGENTHERAPY, by Franz Buschke, M.D.; Simeon T. Cantril, M. D.; and Herbert M. Parker, M. Sc.; *from The Tumor Institute of The Swedish Hospital, Seattle, Wash.* 297 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price $10.50.

This work is an account of the experience of the authors over a period of 8 years in the use of 800 kv. roentgenotherapy. The book is divided into 11 chapters with titles as follows:

I. Physical Considerations of Supervoltage Irradiation.
II. Carcinoma of the Oral Cavity.
III. Malignant Tumors of the Pharynx.
IV. Carcinoma of the Oesophagus.
V. Carcinoma of the Maxillary Sinus.
VI. Carcinoma of the Larynx.
VII. Carcinoma of the Bladder.
VIII. Carcinoma of the Breast.
IX. Carcinoma of the Cervix Uteri.
X. Tumors of the Pituitary Gland.
XI. Conclusions.

In the preface the authors state: "The emphasis of the present monograph is on the clinical and therapeutic aspects of the problem. * * * We wish to emphasize from the very beginning that we do not believe supervoltage radiation therapy has fundamentally changed the concept of the clinical management of cancer by roentgenotherapy as taught by Coutard."

Each chapter dealing with tumor therapy is introduced by a brief discussion of clinical and histologic types and is followed by a number of detailed case histories. The authors are justly proud of their good results and at the same time freely admit errors of judgment in the use of their equipment. There are many radiologists who will not share their enthusiasm for supervoltage therapy in such lesions as carcinoma of the oral cavity, pharynx, maxillary sinus, and larynx, and there are many who will not follow their method of preoperative irradiation of cancer of the breast. On the other hand, their handling of patients with carcinoma of the esophagus and bladder and tumors of the pituitary gland is commendable. The authors do not attempt a statistical analysis of the patients treated. Some criticism may be directed at their method of reporting dosage in terms of the *sum* of skin dose to two or more treatment portals, however they have, by means of tables, indicated tumor doses in most cases.

A short bibliography is given at the end of most chapters. The index is simple and adequate. Several charts giving the details of treatment of carcinoma of the esophagus appear to be upside down on the page and are difficult to read.

This is not a textbook of supervoltage roentgenotherapy but rather a reference book for the experienced roentgen therapist interested in reading about the personal experience of careful users of a powerful therapeutic instrument.

—*Col. E. A. Lodmell, MC, U. S. A.*

POSTGRADUATE GASTROENTEROLOGY, As Presented in a Course Given Under the Sponsorship of The American College of Physicians in Philadelphia, December MCMXLVIII. Edited by Henry L. Bockus, M. D., *Professor of Gastroenterology, University of Pennsylvania Graduate School of Medicine.* 670 pages; 258 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price $10.

This is not a textbook but a well-organized collection of papers presented in December 1948 as a brief course covering recent advances in gastroenterology

offered by the American College of Physicians. Most of the contributions are from the University of Pennsylvania. No attempt has been made to cover all the diseases of the gastrointestinal tract. Major disease entities of each portion of the gastrointestinal tract are discussed with emphasis on recent developments and current problems. There is a discussion of abdominal pain and of gastrointestinal problems of neuropsychiatric, allergic, and endocrine origin. The emphasis throughout is primarily clinical and intensely practical. The questions submitted by the students and answers given by the panel members are included.

The book is well edited, very few fads are discussed, and conflicting opinions are reviewed in the panel discussion sections. Many excellent reproductions of roentgenograms are included. Internists with special interest in gastroenterology will find this book a valuable addition to their library. Radiologists should view the illustrations with the thought of emulating the technique which produced them.—*Lt. Col. B. H. Sullivan, Jr., MC, U. S. A.*

A TEXTBOOK OF ORTHODONTIA, by Robert H. W. Strang, M. D., D. D. S., *Director of courses in orthodontia in the extension teaching departments of Columbia University and the University of Toronto; Director of the Fones School of Dental Hygiene, University of Bridgeport; Co-editor of "The Angle Orthodontist"; Consulting Oral Surgeon to the Bridgeport Hospital, Bridgeport, Conn.* 3d edition. 825 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price $15.

This third edition of what is now a standard work has been extensively revised with over 90 pages having been added. In this edition Dr. Strang continues to emphasize the angle procedures but has made reference to other techniques and theories. There are 34 chapters and a very valuable appendix on office equipment and routine. Chapter 14 on "Tissue changes taking place coincidental to tooth movement" is an accurate presentation of the work of Oppenheim. One must inquire as to the continued use of Oppenheim's original photomicrographs (drawings) since at no time did they adequately portray the points in question. Today far better photomicrographs of the changes incident to tooth movement are available and certainly they should be used. The technical content of the book is excellent and the diagrams and photographs used are of high quality. Little can be said of this work other than to state that the author's activities in compiling this edition have brought up to date a textbook which continues to be one of the outstanding works in the field of orthodontia. Students, teachers, and practitioners will find this book entirely worthwhile and a valuable addition to their library.—*Lt. Col. J. L. Bernier, DC, U. S. A.*

COAGULATION, THROMBOSIS, AND DICUMAROL, With an Appendix on Related Laboratory Procedures, by Shepard Shapiro, M. D., *Assistant Professor of Clinical Medicine, New York University College of Medicine; Visiting Physician, Third (New York University) Medical Division, Goldwater Memorial Hospital; Associate Physician, Lincoln Hospital;* and Murray Weiner, B. S., M. S., M. D., *Fellow in Medicine, New York University College of Medicine; Research Assistant, Third (New York University) Medical Division, Goldwater Memorial Hospital; Assistant Visiting Physician, Willard Parker Hospital Chest Service; Clinical Assistant Visiting Physician, Bellevue Hospital.* 131 pages. Brooklyn Medical Press, New York, N. Y., publishers, 1950. Price $5.50.

This concise monograph is an excellent attempt on the part of the authors to compile the known facts and present the modern concept of anticoagulants and their influence on coagulation and thrombo-embolic disease. The approach to

the problem is both basic and clinical, dealing in the first three chapters with every aspect of the nature and function of the clotting process and the relationship of clotting to hemostasis; the latter seven chapters are concerned with the clinical aspect of thrombo-embolic diseases and their therapy, with special emphasis on dicumarol. This book has been written for the clinicians and pathologists who are faced with the problems of anticoagulant therapy daily, and who do not have the time to cope with the voluminous and often contradictory literature on the subject. An appendix consisting of the most accurate and practical laboratory methods in the study of hemorrhagic diseases and anticoagulant therapy is presented. One of these is the photo-colorimetric determination of dicumarol plasma concentration which may in the future obviate the necessity of daily prothrombin times in the use of dicumarol. Every clinician and clinical pathologist concerned with anticoagulant therapy should be familiar with this book.—*Lt. (jg) P. K. Hamilton (MC) U. S. N.*

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